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PHYSICS ABSTRACTS

BEING

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ABSTRACTS 2008-2211

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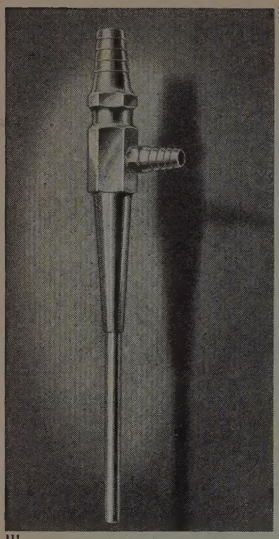

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MATHEMATICS

2008 517.512.2 : 621.3.09

A more symmetrical Fourier analysis applied to transmission problems. HARTLEY, R. V. L. *Proc. Inst. Radio Engrs, N.Y.*, 30, *pp.* 144–150, *March*, 1942.—[Abstr. 1036 B (1942)].

See Abstr. 2202 518.3 : 542.48

2009 518.5 : 358 : 621.3.09 = 3

On electrical calculators of high accuracy, with special reference to a new distance-meter for A.A. artillery (Verograph). FISCHER, F. *Schweiz. Arch. angew. Wiss. Techn.*, 8, *pp.* 1–15, *Jan.*, 1942.—[Abstr. 1037 B (1942)].

2010 518.5 : 535.313.2

The cinema integraph in interreflection problems. HEDEMAN, JR., W. R. *J. Math. Phys.*, 20, *pp.* 402–417, *Dec.*, 1941.—A surface reflecting according to the cosine law, and having a symmetry such that the problem is 1-dimensional (e.g. the inside of a hollow cylinder) may have its luminosity evaluated by integral equations, which are conveniently solved to a sufficient precision by using a cinema integraph, which gives a series of ordinates of $\int_a^b f(x) \,.\, F(x) \,.\, dx$ as readings of the response of a photocell to light from a constant line source, which passes through 2 masks of cinema film depicting $[f(x)]_a^b$ and $[F(x)]_a^b$ in silhouette. A numerical example is given, and the results compared with an approx. solution due to Buckley. G. F. F.

2011 518.5 : 621.392.51

Electronic differentiation. SCHMITT, O. H., AND TOLLES, W. E. *Rev. Sci. Instrum.*, 13, *pp.* 115–122, *March*, 1942.—[Abstr. 948 B (1942)].

2012 519.24

Studies in educational statistics. III. SHINTRE, R. P. *J. Univ. Bombay*, 10, *pp.* 12–28, *Nov.*, 1941.—Statistics of examination results. [See Abstr. 1449 (1942)].

ASTRONOMY

2013 521.04

The theory of stellar structure, 1932–1942. COWLING, T. G. *Observatory*, 64, *pp.* 224–228, *May*, 1942.—Recent progress in the knowledge of the opacity of stellar matter is reviewed; most of the discrepancies existing 10 years ago have been removed either by a change in the assumed H content or by allowance for electron scattering. Subatomic energy release in the interior of stars is so sensitive to temperature that radial oscillations of such stars as Cepheids are now explicable. A star probably consists of a radiative zone covering a dense convective core in which its energy is produced. Observations on the ellipticity of the light-curve and on the apsidal rotation in eclipsing binaries do not conflict with present views on stellar structure, but cannot be said to confirm them. A. HU.

2014 522

Instrumental technique in astrophysics. HUNTER, A. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 186–199, 1942.—Recent devices for saving light in telescopes and spectrographs are reviewed, and the results accruing from their use are indicated. Modern methods of photo-electric photometry and spectrophotometry are described, and the impetus given to photographic photometry by recent developments in automatic microphotometers is pointed out. The development of coronagraphs and of new forms of spectroheliographs is traced and their probable effect on our knowledge of solar processes is indicated. A. HU.

2015 522.2 : 621.316.718

Electrical features of the 200 in. telescope. RULE, B. H. *Elect. Engng, N.Y.*, 61, *pp.* 67–78, *Feb.*, 1942.—[Abstr. 1075 B (1942)].

2016 523.1

On the large-scale distribution of matter in the universe. ZWICKY, F. *Phys. Rev.*, 61, *pp.* 489–503, *April* 1 *and* 15, 1942.—The luminosity function at present adopted for the external galaxies is shown to be inconsistent with the principle of the conservation of energy and the virial theorem in a stationary universe. Statistical considerations applied to distributions of the Boltzmann and Smoluchowski types yield results in good agreement with the observed distribution of clusters of nebulae, but suggest that a large number of intrinsically faint nebulae are yet to be discovered. The local group already deviates in this direction from the hitherto accepted distribution. Qualitative criteria are given to facilitate the search for intrinsically faint stellar systems. A. HU.

2017 523.161

Molecular sodium hydride in interstellar space. PANKHURST, R. C., AND PEARSE, R. W. B. *Nature, Lond.*, 149, *pp.* 612–613, *May* 30, 1942.—[See Abstr. 506 (1941)].

2018 523.74

Provisional sunspot-numbers for November, 1941, to January, 1942. BRUNNER, W. *Terr. Magn. Atmos. Elect.*, 47, *p.* 14, *March*, 1942.

See Abstr. 2205 523.74 : 550.384

See Abstr. 2206 523.74 : 550.385

2019 523.78

Solar eclipse observations in China. TAI, W. S. *Observatory*, 64, *p.* 239, *May*, 1942.

GENERAL PHYSICS

2020 53.081.5

On the dimensions of physical magnitudes. DINGLE, H. *Phil. Mag.*, 33, *pp.* 321–344, *May*, 1942.—On the basis of certain postulates, dimensional ambiguities in the measurement of temperature, time, electrostatic and magnetic quantities, are critically discussed. The general line is that the whole matter rests upon conventions established in the main with due regard to each other and to current physical needs in the interpretation of experimental facts; the interdependence of some of these conventions is, however, sometimes overlooked and leads to confusion. It is held that any amendment of definition

should for this reason be the subject of general consultation and agreement; such amendment, however, is not regarded in itself as bad, provided that it is regulated in accordance with advance of knowledge in physics viewed as a whole. G. F. F.

2021 53.081.5

Note on Prof. W. Wilson's "Dimensions of physical quantities." BROWN, G. B. *Phil. Mag.*, 33, *pp.* 367–368, *May*, 1942.—A reply to criticisms. [See Abstr. 379 (1942)]. G. C. McV.

2022 53.081.5

Dimensions. CAMPBELL, N. *Phil. Mag.*, 33, *p.* 398, *May*, 1942.—The assignment of dimensions is a means to an end. Literature on the subject is vast and controversial. These cardinal ends are suggested: (1) avoidance of algebraic error and the attaching of undue import to numerical coincidence; (2) statement of laws in their most compact and general form; (3) elucidation of the best form in which to express results of measurement; (4) deduction of numerical laws with the min. of mathematical analysis; (5) identification of ultimate theories (e.g. on the ultimate *L*, *M*, *T* dimensional convention). G. F. F.

2023 53.081.6

The general physical constants as of August 1941 with details on the velocity of light only. BIRGE, R. T. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 90–134, 1942.—Recalculations of the values of the general physical constants have been made with data available up to August 1941. The value of the velocity of light is dealt with in most detail. The accuracy of the Michelson (1927) method has been overestimated, but there is no variation with time. The value adopted is (299 776 ± 4) km./sec. Other constants considered are the Newtonian const. of gravitation, the mean density of the earth, the connection between the litre and the cubic decimetre, the normal mole volume of an ideal gas, the standard atmosphere, the absolute temperature of the ice point, the Faraday, the ratio of international to abs. electrical units, the atom. wt. of certain elements, the Joule equivalent, the ratio e/m, and the Planck constant. Tables showing the accepted values of these constants and ratios, and the values of constants deduced from them are given. A. J. M.

2024 530.1

Some disputed questions in the philosophy of the physical sciences. WHITTAKER, E. T. *Phil. Mag.*, 33, *pp.* 353–368, *May*, 1942.—[See Abstr. 1229 (1942)].

2025 530.145

The last multiplier in quantum mechanics. RAO, D. K. *Half-Yrly J. Mysore Univ.*, 2, *pp.* 1–4, *Sept.*, 1941.

2026 530.145

Theory of the electric charge and the quantum theory. III. FLINT, H. T. *Phil. Mag.*, 33, *pp.* 369–383, *May*, 1942.—[See Abstr. 2026 (1940)]. The representation of quantum theory and gravitational theory by a 5-dimensional geometrical scheme is considered. The mathematics involved in displacements of vector operators referred to a set of unit base vectors and to the set of conjugate vectors are given. The analogues of Maxwell's equations are established, in which the analogues of the scalar and vector potentials and of the field components are operators. An expression for the current vector is derived. G. C. McV.

2027 530.16

The problem of the autonomy of life. KAPP, R. O. BEADNELL, C. M. DONNAN, F. G. *Nature, Lond.*, 149, *pp.* 551–552, *May* 16, and 150, *pp.* 123–124, *July* 25, 1942.—Correspondence.

2028 531.719.24

A short-gauge-length extensometer and its application to the study of crankshaft stresses. GADD, C. W., AND DEGRIFT, T. C. VAN. *J. Appl. Mech.*, 9, *A15–A20*, *March*, 1942.—A beam of light is received on a photocell connected to a micro-ammeter. In the beam is a double grating with ruled transparent and opaque strips. One grating is mechanically connected to the test piece and the other fixed. Relative motion causes an alteration in the transmitted light. Using 120 lines/in. a magnification of 30 000 is possible. E. H. W. B.

2029 531.731.3 : 624.19

Volume of tunnel masonry. DUBAS, C. *Schweiz. Bauztg*, 118, *pp.* 307–308, *Dec.* 27, 1941.—The thickness t of a tunnel wall of perimeter s gives the area of section when integrated along the curved line s. By taking $y = t + t^2/2R$ where R is the radius of cm. value and integrating $\int y ds$ along the rectangular axes the same area is obtained. Numerical examples show the integral worked out, using Simpson's rule for a circular profile and an end-ordinate method for an elliptical profile. Volume follows very simply if the tunnel is straight; otherwise the length of trace of the centre of gravity should be found. G. F. F.

2030 531.751.081

Fundamental laws and definitions in physics. III. Mass. HANSEL, C. W. *Proc. Phys. Soc., Lond.*, 54, *pp.* 164–204, *March*, 1942.—A very thorough and careful study of the merits and demerits of the various true and hybrid units used in the representation of mass and weight, and of the confusion that results from imperfect presentation and understanding. An appendix on American treatment is added, and among the recommendations are (1) "mass" and "weight" should from the first be vested with their scientific meaning, without reference to legal terminology; (2) a name is wanted for the gravitational unit of mass (e.g. "slug"); (3) standard notation and descriptions should always be used; (4) chaotic hybrid units should be ignored. G. F. F.

See Abstr. 2152 531.754 : 536.4 : 537.311.3 : 621.318.22 : 539.24

2031 531.754 : 539.217.1

Density and porosity of carbonaceous materials. SMITH, JR., R. C., AND HOWARD, H. C. *Industr. Engng Chem.*, 34, *pp.* 438–441, *April*, 1942.—The densities of a number of experimental and commercial cokes have been measured with 3 different filling fluids—helium, water and mercury. The values found in helium are chiefly a function of the temperature to which the material has been subjected and are only slightly affected by the heating rate during carbonization. The greater number of the commercial high-temperature cokes give values of density with helium which lie between 1·95 and 2·00. The values found in mercury are lower than those

determined in helium. Porosities, calculated from the differences in density in mercury and in helium, range from 6% to 23% for the commercial high-temperature cokes. The usual method of determining density, using water as a filling fluid, shows larger differences between different cokes than were observed with helium and gives values which average somewhat lower.

2032 531.756

Determining liquid and vapour densities in closed systems. WAGNER, G. H., BAILEY, G. C., AND EVERSOLE, W. G. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 129–131, *Feb.* 15, 1942.—A quartz bob suspended by a quartz helix will be buoyed in proportion to the density of the immersion fluid (a gas), and when inverted will behave similarly for liquids, where the whole is fully immersed. The extension of the helix may be calibrated. The theory is given in full. E. H. W. B.

2033 531.756

Specific gravity of petroleum oils by the falling-drop method. HOIBERG, A. J. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 323–325, *April* 15, 1942.—A method of densimetry has been modified to adapt its use to measurement of the sp. gr. of petroleum oils. The procedure depends on the measurement of the time of fall of a drop of oil in an alcohol-water solution. The sp. gr. is determined from a calibration curve for the solution. This method has been found accurate to within $\pm$ 0·0010 unit.

2034 531.756

A modified micropipette for density determinations in heavy-water analysis. ROSEBURY, F., AND HEYNINGEN, W. E. VAN. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 363–364, *April* 15, 1942.

2035 531.758

The determination, by smoke manometer, of the ratio of density of town gas to that of air at the same temperature and pressure. SEARLE, G. F. C. *Proc. Phys. Soc., Lond.*, 54, *pp.* 278–288, *May*, 1942.—The buoyancy effect of a column of coal gas is balanced against that of a column of hot air. At their upper ends, the columns are in free communication with the atmosphere. The lower ends of the tubes containing the gas and the hot air are joined to a smoke manometer; communication between the columns is established by turning a tap. The absence of drift of the smoke indicates that the pressures at the lower ends of the columns are equal. In a second method, the buoyancy effect of the gas is balanced against the defect of pressure due to the combination of a whirling arm and a static-head tube described in an earlier paper [Abstr. 2505 (1941)].

See Abstr. 2046 531.787 : 532.71

2036 531.787 : 612.1

The physics of blood-pressure measurement. EVANS, D. S., AND MENDELSSOHN, K. *Proc. Phys. Soc., Lond.*, 54, *pp.* 211–219, *May*, 1942.—The physical basis of blood-pressure measurement is formulated. An arrangement for recording the essential features of the pulse curve is described, and the relation between the recorded values and the pressure changes in the artery discussed. The results have been confirmed by clinical observations.

See Abstr. 2127 531.787.9 : 537.726

See Abstr. 2114 532 : 537.311.2

2037 532.13

Studies of relative viscosity of non-aqueous solutions. BRISCOE, H. T., AND RINEHART, W. T. *J. Phys. Chem.*, 46, *pp.* 388–394, *March*, 1942.—The variation of rel. viscosity with temperature is studied for solutions of naphthalene in benzene and in methanol, of diphenyl in benzene, and of KI in methanol and in glycerol. The rel. viscosity decreases with increasing temperature for all solutions studied except that of KI in glycerol. The viscosity of the solvent was lowered by the addition of a solute only in the case of the solution of KI in glycerol. Only the solutions containing KI exhibited the Grüneisen effect. For KI in glycerol, $(\eta_0 - 1)/C$ first decreases and then increases, after reaching a min. at $C = 0{\cdot}7$.

See Abstr. 2048 532.13 : 532.77

See Abstr. 2192 532.13 : 537.311.3 : 541.182.6

See Abstr. 2191 532.13 : 541.182.6

2038 532.137

Rotary viscometer for determination of high consistencies. TRAXLER, R. N., ROMBERG, J. W., AND SCHWEYER, H. E. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 340–344, *April* 15, 1942.—The design, construction and operation of a rotating-cylinder viscometer are discussed. Its application to rheological studies is illustrated by results for asphalts over a range of 0·001 to 1 000 megapoises.

See Abstr. 2108 532.14 : 536.758

2039 532.542

A method of determining the pressure drop for oil-vapour mixtures flowing through furnace coils. DITTUS, F. W., AND HILDEBRAND, A. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 185–192, *April*, 1942.—The equations given in the paper are set up to determine the pressure gradient for the part of the furnace where a liquid-vapour composition exists, particularly in the case of a vaporizing petroleum oil.

See Abstr. 2096 532.542 : 536.242

2040 532.574.6 : 621.317.082.744 = 3

Method of fluid-flow measurement. THÜRLEMANN, B. *Helv. Phys. Acta.*, 14, 5–6, *pp.* 383–419, 1941.—A method and an instrument, based on induction and without recourse to any mechanical device, have been developed to measure flow. Operation is independent of the nature of the fluid, and of the temperature and pressure. W. A. R.

2041 532.591

The effect of a free surface on compressional (shock) waves. BICKLEY, W. G. *Proc. Roy. Soc. A*, 180, *pp.* 209–218, *June* 5, 1942.—The effect of a free surface in releasing the shock pressure is studied, for both shallow and deep water, by the exact mathematical solution of several idealized problems. Formulae emerge which display discontinuities of the type which could be qualitatively predicted on physical grounds, as representing the effect of successive reflections at bed and free surface; some graphs showing the quantitative march of events calculated from the formulae are given. The pressure seems never to exceed the shock pressure due to the max. velocity of

impact, but suction occurs in some cases; this suction may have serious effects as regards erosion. The surface elevation shows the characteristic splash at the wall, becoming mathematically infinite there.

See Abstr. 2049 532.61 : 532.77

2042 532.61.08

Reproducible contact angles on reproducible metal surfaces. I. Contact angles of water against silver and gold. BARTELL, F. E., AND CARDWELL, P. H. *J. Amer. Chem. Soc.*, 64, *pp.* 494–497, *March*, 1942.—Solid surfaces with reproducible properties were obtained by vaporizing the solid in a vacuum, condensing the vapours as a film or coating upon a supporting medium, and subsequently protecting the surface from alteration by adsorption, or by regulating the extent of alteration. The max. advancing water contact angle for Ag was $95° \pm 0{\cdot}5°$. That for Au was $92{\cdot}5° \pm 0{\cdot}5°$. The max. receding contact angle was $38° \pm 1°$ for Ag, and $34° \pm 1°$ for Au. Corresponding angles were the same whether measured with water drop or air bubble. Adsorption of air caused the surfaces to become more hydrophobic. Hysteresis effects are closely related to alteration of the metal surfaces by adsorption and desorption of air. When a water drop was allowed to stand for a few min. on a Ag or Au surface and then caused to recede, the periphery of the drop became immobilized, and as the bulk of the liquid disappeared the receding angle approached, or actually became, zero.

See Abstr. 2043 532.61.08 : 532.614.3

See Abstr. 2188 532.612 : 541.182

2043 532.614.3 : 532.61.08

Surface energy relations in liquid/solid systems. I. The adhesion of liquids to solids and a new method of determining the surface tension of liquids. MACDOUGALL, G., AND OCKRENT, C. *Proc. Roy. Soc. A*, 180, *pp.* 151–173, *June* 5, 1942.—A new method for determining the surface tension of liquids involves the consideration of the advancing and receding contact angles of a liquid drop on a tilted solid surface. The theory has been tested by an improved optical projection technique for a variety of liquid/solid systems and the results obtained are in agreement with the accepted values. The advancing and receding contact angles are characteristic const. of liquid/solid systems and the calculated and measured values of the min. receding angles are in agreement. The prevailing views of "hysteresis" effects or "stationary" contact angles are incorrect. The difference between the adhesions corresponding to the advancing and receding angles is ascribed to the work done in removing an adsorbed unimolecular layer. The variation in the value of the advancing angle in some liquid/solid systems and its constancy in others is reconciled with the polar character of the solid surface.

2044 532.63 ≐ 3

On capillary systems. MANEGOLD, E., KOMAGATA, S., AND ALBRECHT, E. *Kolloid Z.*, 93, *pp.* 166–198, *Nov.*, 1940.—Continuing previous research [Abstr. 396 (1942)] the authors develop a theory for determining the distribution curve of the channel number in polycapillary channel systems. The channel number is defined for homocapillary systems by the total number of pore openings and by the total length of the gaps, each per cm.^{2} of the surface of the test piece. The polycapillary system consists of a homogeneous mixture of many homocapillary systems, and is idealized as having channels of fixed length. Under these assumptions the theories of Erbe [Abstr. 3309 (1933)] and of Grabar and Nikitine are generalized. The inconstancy of the velocity of flow with const. pressure, and its causes, are discussed. Experimental results of previous investigators are surveyed in the light of the generalized theory. R. N.

2045 532.71 = 3

On anomalous osmotic effects with chain molecules. KLAGES, F. *Kolloid Z.*, 93, *pp.* 19–28, *Oct.*, 1940.—While many chain molecules show a normal behaviour, those based on carbo-hydrates show osmotic anomalies which make Raoult's law inapplicable for the determination of the mol. wt. The preliminary experiments seem to confirm the assumption that the effect is due to the shape of the molecular chain, which resembles a string of larger ring-shaped structures connected by bridging atoms. R. N.

2046 532.71 : 531.787

The thermo-electric method of measuring vapour pressure. ROEPKE, R. R. *J. Phys. Chem.*, 46, *pp.* 359–366, *March*, 1942.—Data are presented to show the sensitivity which may be obtained with Baldes' modification of the thermoelectric method of measuring v.p. [Abstr. 3127 (1934)]. Evidence is presented to show that the temperature of a drop of solution placed on a thermocouple loop is independent of its size.

See Abstr. 2183 532.73 : 541.18

2047 532.77

The diffusion coefficient of cupric sulphate from 0·0 to 0·35 molar at 25°C. EVERSOLE, W. G., KINDSVATER, H. M., AND PETERSON, J. D. *J. Phys. Chem.*, 46, *pp.* 370–375, *March*, 1942.—[See Abstr. 1029 (1942)]. The diffusion coeff. decreases continuously over the conc. range 0·0 to 0·35 molar.

2048 532.77 : 532.13

Solubility of polybutene in pure solvents. EVANS, H. C., AND YOUNG, D. W. *Industr. Engng Chem.*, 34, *pp.* 461–466, *April*, 1942.—The viscosity number of the polymer solutions over the approx. conc. range of 10 to 80 g./l. was measured. Log N was found by this method not to be a linear function of conc. in the higher ranges. Chlorinated solvents having dielectric const. > 8 will not dissolve high-mol.-wt. polybutene at room temperature.

2049 532.77 : 532.61

Studies on high-molecular-weight aliphatic amines and their salts. V. Soluble and insoluble films of the amine hydrochlorides. HOFFMAN, E. J., BOYD, G. E., AND RALSTON, A. W. *J. Amer. Chem. Soc.*, 64, *pp.* 498–503, *March*, 1942.—The variation of surface tension of solutions of dodecylamine hydrochloride with conc. has been investigated at a series of temperatures by the ring method. Time effects of long duration were encountered in solutions below the critical conc. for micelle formation. Insoluble mono-

layers of octadecylamine hydrochloride spread on various sub-solutions have been investigated by the film balance. An increase in temperature causes the films to become more expanded. The heat of spreading at an area of 35 Å^2 per mol. was estimated to be 320 ergs cm.$^{-2}$. This value was compared with values for other insoluble films possessing different polar groups. An increase in the size of the anion in the case of the hydrohalide films at small areas gives the effect of increased temperature. The behaviour of oxygen acid salts of octadecylamine has been studied.

2050 532.78

Co-precipitation of radium and barium salts as a function of temperature and acidity. PIETENPOL, W. B. *J. Chem. Phys.*, 10, *pp.* 211–214, *April*, 1942.—Co-precipitation which accompanies the cooling of a solution results in the deposition of a percentage of Ra largely in excess of that of Ba. The relative amounts are determined at different temperatures throughout the cooling process and curves are plotted. The efficiency of the refining process may be increased by separating liquor and crystals at a point above room temperature. With rapid cooling a smaller percentage of Ra is precipitated than with slow cooling.

2051 533.15 : 539.155.2 : 533.7

The theory of gaseous isotope separation in a force field with application to the ultracentrifuge. WILSON, G. H. *Univ. Pa, Delaware Notes*, 14, [25 *pp.*], 1941.—Lamm's equation for the transport of molecules in a field of force is considered for cases where the sedimentation and diffusion coeff. are not const. These coeff. depend on the m.f.p. of the molecules. A kinetic-theory derivation of the transport equation is given, and the equation is solved. A typical calculation is given for separation of a mixture of Cl_2^{35} and Cl_2^{37}. A. J. M.

2052 533.16 = 3

The inner friction of gases and vapours and its measurement with a Höppler viscometer. WOBSER, R., AND MÜLLER, F. *Kolloid-Beih.*, 52, 6–7, *pp.* 165–276, 1941.—[See Abstr. 2761 (1933)]. The theory and design are discussed, especially the measures for obtaining reproducible results. By making the angle of inclination of the viscometer tube variable its applicability to rapid, accurate tests is enhanced. The Sutherland const. and the viscosity/temperature function are determined between 20° and 100°C. for air and a number of gases. The results are compared with those of previous investigators. R. N.

2053 533.17 : 539.217.1 : 534.64

The measurement of flow resistance of porous acoustic materials. BROWN, R. L., AND BOLT, R. H. *J. Acoust. Soc. Amer.*, 13, *pp.* 337–344, *April*, 1942.—The flow resistance per unit cube is given by $r = pAt/Vl$, where p is the pressure drop in dynes/cm.^{2} across l cm. of a sample of area A cm.^{2} when a volume V cm.^{3} of air flows through in t sec. An accurate method was developed for obtaining r by direct measurements of the quantities p, A, t, V and l. Measurements were made on 24 materials over a wide range of velocities. For most materials the resistivity is const. below 0·1 cm./sec. but increases considerably at higher velocities. A direct correlation is found between the steady-stage flow-resistance values and the resistive component of acoustic impedance for several materials.

2054 533.6.07 : 621.314.52

Variable-speed drive for United States Army Air Corps wind tunnel at Wright Field, Dayton, Ohio. DICKEY, A. D., LAFFOON, C.M., AND KILGORE, L. A. *Trans. Amer. Inst. Elect. Engrs*, 61, *pp.* 126–130, *March*, 1942.—[Abstr. 1052 B (1942)].

2055 533.6.68

Piston effect of trains in tunnels. DAUGHERTY, R. L. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 77–82; *Disc.*, 82–84, *Feb.*, 1942.—Measurements were made of the friction of air through the empty tunnel, and of air pressures developed by different trains.

See Abstr. 2051 533.7 : 539.155.2 : 533.15

See Abstr. 2106 533.75 : 539.133 : 536.7

SOUND. VIBRATIONS

2056 534.22 + 534.37] : 536.633.4

An improved apparatus for supersonic velocity and absorption measurements. TELFAIR, D., AND PIELEMEIER, W. H. *Rev. Sci. Instrum.*, 13, *pp.* 122–126, *March*, 1942.—A reinvestigation of the sonic method of determining gaseous heat capacities [Abstr. 810 (1935)]. The apparatus and method described were used in measuring the velocity of sound in air [Abstr. 1036 (1942)], in a study of the variation with temperature of the heat capacity of propylene, sonic dispersion in methane and heat-capacity measurements in butadiene. The absorption of sound in propylene indicates that this gas has a much shorter relaxation time than most of the other polyatomic gases which have been investigated; the same is true for butadiene. The measurements on a methane of low purity show that a dispersion region exists with max. absorption at 300 kc./s. for temperatures round 100°C. at atmospheric pressure. G. E. A.

2057 534.322.3 : 538.652 : 621.3.042.2 : 621.314.21

The causes and characteristics of transformer noise. SWAFFIELD, J. *Rep. Brit. Allied Industr. Res. Assoc., Ref. Z/T 49a. J. Instn Elect. Engrs*, 89, *Part I, pp.* 212–224, *May*, 1942.—[Abstr. 1049 B (1942)].

See Abstr. 2056 534.37 + 534.22] : 536.633.4

2058 534.372

Vibration and rubber springs. KEYS, W. C. *Mech. Engng, N.Y.*, 64, *pp.* 175–180, *March*, 1942.—When springs or mountings are used to reduce the transference of a vibration, the transmissibility of the mounting is defined as (spring force)/(impressed force) = (transmitted force)/(impressed force), which, when damping is negligible, = $1/\{1 - (\text{forced-frequency}/\text{natural-frequency})^2\}$. Curves are given of transmissibilities for various static deflections and vibration frequencies, and these charts may be used to establish the static deflection of mountings required to absorb a wide range of forced frequencies. Since, in practice, it is not usually possible to change merely the stiffness of mountings, the actual reduction of vibratory amplitude may be less than the calculated transmissibility, and measurements are made of the amplitude residue, defined as the ratio of the amplitudes when resiliently and when rigidly mounted.

Details are given of various types of rubber mounting with some typical test results. A. C. W.

2059 534.374

Acoustic filtration in parallel-conduit structures. LABAW, L. W. *J. Acoust. Soc. Amer.*, 13, *pp.* 345–352, *April*, 1942.—The filtration characteristics of 5 Quincke–Herschel tubes in series were measured in 3 ways: (*a*) by observing the ratio of the squares of the excess pressures at the end and beginning of the filter when terminated by a closed and open finite ending; (*b*) by observing the phase difference between these pressures; and (*c*) by observing the true power transmission ratio with the filter terminated by an effectively infinite line. The number of experimental peaks in the transmission regions in (*a*) and (*c*), and the positions of the attenuation bands, agree with theory.

2060 534.374

Acoustic filtration by membranes. LABAW, L. W. *J. Acoust. Soc. Amer.*, 13, *pp.* 353–359, *April*, 1942.—An experimental and theoretical study of the filtering action of a structure consisting of 5 stretched circular membranes equally spaced in an acoustic conduit together with an experimental study of the effect of puncturing the membranes with different-sized holes. It is valid to assume plane-wave propagation in the circular membrane filter up to 5 000 c./s.

See Abstr. 2053 534.64 : 539.217.1 : 533.17

2061 534.84

Acoustic properties of the Gol Gumbaz, Bijapur. PARANJPE, G. R. *J. Univ. Bombay*, 10, *pp.* 124–132, *Nov.*, 1941.—The Gol Gumbaz, built as the tomb of a sultan in 1656, consists essentially of a great square hall surmounted by an enormous dome. The gallery round the base of the dome is over 124 ft. in dia. and 109 ft. above the floor. It possesses whispering and multiple-echo effects. When sounds are produced at one end of a diameter and received at the other end, the audibility improves as the frequency increases. Pure notes of frequencies 700 and 3 000 were distinctly heard at the opposite end when their outputs were 0·4 and 0·025 μW resp., under not quite silent conditions. With the multiple-echo effect the number of echoes counted was from 22 to 25. The size of the hall is 135 × 135 × 109 ft. and the reverberation time is 20 sec. G. E. A.

2062 534.85

The correlation between elastic deformation and vertical forces in lateral recording. BEGUN, S. J., AND LYNCH, T. E. *J. Acoust. Soc. Amer.*, 13, *p.* 392, *April*, 1942.—Erratum. [Abstr. 1047 (1942)].

OPTICS

2063 535.24

Photometry. BUCKLEY, H. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 318–337, 1942.—Summarizes the progress made in the last 8 years. The primary standard based on the black-body at the Pt point has now been adopted and at the outbreak of war a new unit was to have been brought into use. This new candle is 1/60 the c.p. of 1 cm.^{2} of the primary standard and the difference from the present international candle is very small. The standard visibility curve of the eye is now adopted as the basis for all heterochromatic photometry. A good deal of work has been done on the validity of this curve. The use of colour filters in visual photometry, particularly for the measurement of discharge tubes, has become general. In physical photometry the use of the rectifier cell has become widespread, especially for illumination measurements. Photometry at very low levels of brightness has been studied extensively and special means are used to avoid the difficulty introduced by the Purkinje effect. J. W. T. W.

2064 535.24 : 771.54

An intensity-scale sensitometer that works at intensity-time levels used in practical photography. BORNEMANN, W., AND TUTTLE, C. *J. Opt. Soc. Amer.*, 32, *pp.* 224–229, *April*, 1942.—A new intensity-scale sensitometer capable of producing a top max. exposure of about 100 m.c.s. in 1/50 sec. has been designed. The instrument exposes 20 steps, one at a time. The individual steps are the same size as those produced by the IIb instrument.

2065 535.243

A logarithm-of-wavelength scale for use in absorption spectrophotometry. SHURCLIFF, W. A. *J. Opt. Soc. Amer.*, 32, *pp.* 229–233, *April*, 1942.—A system arranged to provide 100 units per spectral octave has been found convenient in connection with instruments which can plot over a number of different ranges and at different magnifications.

2066 535.247 : 595.7

A method of recording low-intensity flashes of light. BUTT, C., AND ALEXANDER, R. S. *Rev. Sci. Instrum.*, 13, *pp.* 151–153, *April*, 1942.—A circuit is described with examples of application to the firefly flash. Between an a.c. source and a high-gain a.c. amplifier, a photocell bridge circuit is introduced which is capable of blocking the a.c. signal when the photocells are dark. Light falling on the photocells allows the a.c. signal to pass the bridge, the output of the bridge being amplified and recorded photographically by the use of the c.r.o.

2067 535.247.4

Illumination measurements with light-sensitive cells. DOWS, C. L. *Illum. Engng, N.Y.*, 37, *pp.* 103–112, *March*, 1942.—When photocells are used for measuring illumination in the field, it is important to take account of possible sources of error, especially the fall of sensitivity with increasing obliquity of the incident light, and the effect of colour, if the light sources are not tungsten filament lamps. A form of test plate is described in which a number of cells, each colour-corrected by means of a filter, are mounted behind a diffusing glass plate. A table of correction factors for uncorrected cells, covering a wide range of light sources, is given. J. W. T. W.

2068 535.247.4 : 535.34 : 544.8

Photo-electrometric particle-concentration analysis. SEAMAN, W., NORTON, A. R., AND MARESH, C. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 350–357, *April* 15, 1942.—A method of photo-electrometric particle-conc. analysis is described for the estimation of one constituent of a mixture which involves measuring, by means of a photocell and a galvanometer, the intensity of the light transmitted by that constituent. The method should be capable of adaptation to any mixture of which one constituent can be made luminous and the other constituents in-

visible or of low luminosity by crossed Nicol prisms, selective staining with the use of colour filters, or fluorescence. The method has been applied (1) to counting starch particles, (2) to the estimation of anthraquinone-β-sodium sulphonate in the presence of the α-isomer, and (3) to the estimation of anthraquinone-1,8-disulphonic acid in the 1,5-isomer by means of a precipitation with Ba.

2069 535.312

Reflection factors of floor materials. MOON, P. *J. Opt. Soc. Amer.*, 32, *pp.* 238–242, *April*, 1942.

2070 535.312

Reflection factors of some materials used in school rooms. MOON, P. *J. Opt. Soc. Amer.*, 32, *pp.* 243–246, *April*, 1942.

2071 535.312

Reflection from paper. BURKE, E. HARRISON, V. G. W. *Nature, Lond.*, 149, *p.* 613, *May* 30, 1942.—Correspondence.

See Abstr. 2010 535.313.2 : 518.5

2072 535.32

Dispersion in the far infra-red. KELLNER, L. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 200–211, 1942.—A report dealing with investigations, undertaken within the last 11 years, into the dispersion of crystalline and liquid substances in the far infra-red ($\lambda > 10\,\mu$). The work is comparatively unknown but is of importance in connection with our knowledge of lattice structure, lattice forces and the electric forces obtaining in liquids. Crystalline dispersion is dealt with at length whilst there is a brief treatment of the dispersion of the liquids. A. H.

See Abstr. 2099 535.323.3 : 536.423.1 : 536.44

2073 535.33 : 536.46

Applications of spectroscopy to combustion. GAYDON, A. G. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 50–70, 1942.—This survey article commences with a résumé of the historical side of the subject. The emission spectra of flames, explosions, cold flames, etc., are dealt with, as well as absorption spectra, the infra-red region, and indirect applications of spectroscopy to combustion problems, such as the calculation of dissociation energies, sp. ht., quantitative considerations of the life-times of activated molecules, and temperature measurement. A. H.

2074 535.33 : 631.41

A spectrochemical method for the determination of boron in synthetic mixtures of soil materials. PARKS, R. Q. *J. Opt. Soc. Amer.*, 32, *pp.* 233–237, *April*, 1942.

See Abstr. 2079 535.33.03 : 537.525.72 : 535.338.332

See Abstr. 2085 535.33.071 : 535.417

See Abstr. 2090 535.33.072 : 535.61

2075 535.338

Molecular electronic spectra, dispersion and polarization. The theoretical interpretation and computation of oscillator strengths and intensities. MULLIKEN, R. S., AND RIEKE, C. A. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 231–273, 1942.—The methods of calculating the abs. transition probabilities for electronic spectra are discussed on a theoretical basis. The results obtained in the actual determination of intensities and their interpretation as regards molecular structure are discussed. Applications to dispersion, molecular refractivities, and other optical properties are discussed. A. J. M.

2076 535.338

The first spectrum of antimony. MEGGERS, W. F., AND HUMPHREYS, C. J. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 463–478, *April*, 1942.—The spectrum emitted by neutral Sb atoms has been photographed, measured and analysed. Measured wavelengths and estimated relative intensities are given for 466 lines, ranging from 1 388·91 to 12 466·75 Å in wavelength and from 1 to 2 500 in intensity. The average difference between observed and computed wave numbers is 0·15 cm.$^{-1}$. A paucity of lines in the visible spectrum and intense radiation in the ultra-violet and infra-red are consequences of the relative values of various groups of levels. The principal ionization potential of antimony is calculated to be 8·64 V.

2077 535.338

The influence of sample composition on magnesium, cadmium and lead intensity ratios as radiated from a spark source. LANGSTROTH, G. O., AND NEWBOUND, K. B. *Canad. J. Res. A*, 20, *pp.* 39–47, *April*, 1942.—Variations have been observed in the rel. intensities of Mg, Cd and Pb lines on the addition of foreign substances to standard samples and excitation in a condensed spark source. The changes depended on the nature and amount of the added substances, as well as on the elements under consideration.

2078 535.338

Frequency spectrum of crystalline solids. MONTROLL, E. W. *J. Chem. Phys.*, 10, *pp.* 218–229, *April*, 1942.—It is shown that the $2n$th moment of the distribution function of normal modes is proportional to the trace of the nth power of the matrix of the Born and von Kármán determinant. By expressing the distribution function as a linear combination of Legendre polynomials it is shown that the coeff. of each polynomial is a linear combination of the moments. The frequency distribution function of a 2-dimensional simple cubic lattice is calculated.

2079 535.338.332 : 535.33.03 : 537.525.72

Electrodeless discharge in mercury and the hyperfine structure of some Hg II lines. SUBBARAYA, T. S., NARASIMHAIYA, R. L., AND SRINIVASAMURTHY, S. *J. Mysore Univ.*, 2, *pp.* 82–87, 1942.—Describes the preliminary stage of an attempt to extend the work on the interaction of atomic energy levels to spark spectra and hyperfine structure. The suitability of the electrodeless discharge for this work is tested, both continuous and damped-wave excitation being employed, the latter being found to be most suitable. A. H.

See Abstr. 2068 535.34 : 544.8 : 535.247.4

2080 535.342

The infra-red absorption of silver cyanide. STALLCUP, W. D., AND WILLIAMS, D. *J. Chem. Phys.*, 10, *pp.* 199–200, *April*, 1942.—The spectrum of powdered AgCN has been studied in the region 2 500–1 800 cm.$^{-1}$. Intense absorption at 2 178 cm.$^{-1}$ is attributed to an oscillation involving the CN group. The CN frequency for AgCN is almost 100 cm.$^{-1}$ higher than the CN frequencies of NaCN and KCN.

2081 535.342
The absorption spectrum of chlorine fluoride. WAHRHAFTIG, A. L. *J. Chem. Phys.*, 10, *p.* 248, *April*, 1942.

2082 535.342
Absorption spectra of potassium permanganate in different media. MURTHY, M. P., AND SINGH, J. *Curr. Sci.*, 11, *p.* 52, *Feb.*, 1942.

See Abstr. 2182 535.37 : 541.143

2083 535.371
Intra-molecular energy transfer. The fluorescence of complexes of europium. WEISSMAN, S. I. *J. Chem. Phys.*, 10, *pp.* 214–217, *April*, 1942.—The characteristic line fluorescence of trivalent Eu is excited in certain organo-europium compounds by irradiation with light absorbed only by the organic part of the compound. The efficiency of excitation varies with the nature of the compound, temperature and solvent. The decay time of the fluorescence is independent of quenching; quenching prevents excitation of the Eu ion.

2084 535.417
Interference spectroscopy. I. MEISSNER, K. W. *J. Opt. Soc. Amer.*, 31, *p.* 211, *April*, 1942.—Errata. [Abstr. 1837 (1941)].

2085 535.417 : 535.33.071
Interference spectroscopy. II. MEISSNER, K. W. *J. Opt. Soc. Amer.*, 32, *pp.* 185–210, *April*, 1942.—[See Abstr. 1837 (1941)]. The compound Fabry–Perot interferometer and the multiple-interference spectroscope are described and expressions for their resolving powers and instrumental half-widths evaluated. Applications of the Fabry–Perot interferometer to absorption-line working and to the plotting of line profiles are discussed, and recent work using high resolving power on atomic beams is described. Finally the theory of the reflection echelon and the methods employed in crossing it with auxiliary dispersion are given. A. HU.

2086 535.43.07 : 621.317.39
Photo-electric smoke meters. WEY, R. J. *Engineer, Lond.*, 173, *pp.* 283–286, *April* 3; 300–303, *April* 10; 320–322, *April* 17, *and pp.* 342–345, *April* 24, 1942.—[Abstr. 1099 B (1942)].

2087 535.52
Polarization of luminescence in crystals. THOSAR, B. V. *J. Chem. Phys.*, 10, *pp.* 246–247, *April*, 1942.

2088 535.565
The specific rotation of *l*-tyrosine. STEIN, W. H., MOORE, S., AND BERGMANN, M. *J. Amer. Chem. Soc.*, 64, *pp.* 724–725, *March*, 1942.

2089 535.6.08 : 577.15
Photo-electric colorimeter for rapid reactions. CHANCE, B. *Rev. Sci. Instrum.*, 13, *pp.* 158–161, *April*, 1942.—A differential photo-electric colorimeter has been built for the high-speed measurement of small absorption changes in enzyme substrate reactions. The total differential change of light intensity was approx. 0·2% and a photo-electric resolution of approx. $1{\cdot}7 \times 10^4$ was achieved, giving an accuracy within 3%.

2090 535.61 : 535.33.072
The M.I.T. wavelength project. HARRISON, G. R. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 212–230, 1942.—A description is given of the powerful new spectrographs which have been developed together with the ancillary automatic comparators, interval sorters and recorders. The organization of the Wavelength Project (Works Project Administration) is described and details given of the Tables being produced. The application of the work to the classification of spectra is discussed. A. H.

2091 535.7 : 621.326.794
Vision and seeing under light from fluorescent lamps. LUCKIESH, M., AND MOSS, F. K. *Illum. Engng, N.Y.*, 37, *pp.* 81–88, *March*, 1942.—Examines the possible effect of green fluorescent and daylight fluorescent lighting on (*a*) visual acuity, (*b*) eye fatigue as determined by rate-of-blinking measurements, (*c*) eye movements in reading, (*d*) accommodation. It is concluded that no such effects take place, at any rate to a noticeable extent. J. W. T. W.

2092 535.755
Colour blindness and its importance in relation to industry. PITT, F. H. G. *Proc. Phys. Soc., Lond.*, 54, *pp.* 219–244, *May*, 1942.—After a description of the various types of colour vision defect and of the corresponding anomalies in the vision of observers affected by them, particularly sensitivity to small differences of hue, the author refers to the various tests for colour blindness in common use. A number of cases are given in which colour blindness may be a handicap, or even a danger, in certain branches of industry. J. W. T. W.

2093 535.8 : 77
A means of increasing the illusion of depth in photographs. REHMAN, I., AND NOBACK, G. J. *Science*, 95, *pp.* 463–464, *May* 1, 1942.—The recent introduction and use of film transparencies has made available a means of obtaining a third-dimensional effect in photographs.

2094 535.81 : 771.35
On the performance of optical instruments with coated lens systems. TYLER, J. E., MORSE, R. S., AND JEWETT, JR., F. B. *J. Opt. Soc. Amer.*, 32, *pp.* 211–213, *April*, 1942.

2095 535.823.5 = 3
The stage vibrator, a novel auxiliary device for ultramicroscopy and microscopy. ARDENNE, M. VON. *Kolloid Z.*, 93, *pp.* 158–163, *Nov.*, 1940.—A vibrator for the object-stage consists of a tuning-fork excited by an electromagnet, the coils of which are connected to the 50 c./s. a.c. supply system. Thus oscillations of 100 c./s. are generated, which cause the suspension drop to pass the speed range between 0 and 12 m./s. 200 times/sec. during the drying process of the suspension. The distributing effect of the vibrator is shown by optical and electronic microscope pictures of a finely ground powder of a ceramic mass with various degrees of enlargement. R. N.

HEAT. THERMODYNAMICS

2096 536.242 : 532.542
Vaporization inside horizontal tubes. II. Benzene-oil mixtures. MCADAMS, W. H., WOODS, W. K.,

AND HEROMAN, JR., L. C. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 193–200, *April*, 1942.—This paper reports an investigation carried out to determine heat-transfer coeff. and pressure drops for mixtures of benzene and lubricating oil flowing inside a heated horizontal tube, and includes an analysis of the pressure drops for the runs previously reported [Abstr. 1486 B (1941)]. For a given feed composition the average coeff. per pass in the boiling section increase as vaporization progresses, but pass through a max. and decrease due to depletion of volatile solvent in the liquid phase.

See Abstr. 2102 536.244.02 : 536.6.081

See Abstr. 2152 536.4 : 537.311.3 : 531.754 : 621.318.22 : 539.24

See Abstr. 2099 536.423.1 : 535.323.3 : 536.44

2097 536.44

Determination of critical temperatures by the rotating bomb. IPATIEFF, V. N., AND MONROE, G. S. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 171–174, *Feb.* 15, 1942.—Experiments on various organic gases indicate that the critical temperatures, when required only to an accuracy within ± 2 deg., may be determined by the rotating bomb. [Abstr. 1958 (1942)]. N. M. B.

2098 536.44

Vapour pressures and critical constants of isobutene. BEATTIE, J. A., INGERSOLL, H. G., AND STOCKMAYER, W. H. *J. Amer. Chem. Soc.*, 64, *pp.* 546–548, *March*, 1942.—[See Abstr. 2577 (1939)].

2099 536.44 : 535.323.3 : 536.423.1

The indirect estimation of critical temperature and of molar refractivity. LIVINGSTON, R. *J. Phys. Chem.*, 46, *pp.* 341–343, *March*, 1942.—For the members of an homologous series, both the critical temperature and the molar refractivity appear to be simple functions of the normal b.p. For a restricted range of values these (unknown) functions can be represented by linear equations. [See Abstr. 1870 (1941)].

See Abstr. 2073 536.46 : 535.33

See Abstr. 2116 536.531 : 537.312.6

2100 536.6

The heat capacities of red and yellow lead monoxides at high temperatures. SPENCER, H. M., AND SPICER, W. M. *J. Amer. Chem. Soc.*, 64, *pp.* 617–621, *March*, 1942.—The construction of an aneroid calorimeter is described. The heat contents of yellow and red lead monoxides were measured between 25° and 400° to 650° and 400° to 550°, respectively.

2101 536.6

Phase transitions. I. The heat capacity of nickel nitrate hexammoniate from 54° to 300°K. The transition at 243°K. LONG, E. A., AND TOETTCHER, F. C. *J. Amer. Chem. Soc.*, 64, *pp.* 629–632, *March*, 1942.—The heat capacity of nickel nitrate hexammoniate has been determined from 54° to 300°K. The substance undergoes a gradual transition between 173° and 247°K., with the max. heat capacity occurring at 243·3°K. The heat of transition is 1 818 cal./mole, and the corresponding entropy is 7·65 ± 0·5 E.U. The transition exhibits supercooling effects. There is an additional region of anomalous thermal behaviour below 80°K. The upper transition is discussed from the point of view of order and disorder in the orientation of nitrate groups in the crystal lattice.

2102 536.6.081 : 536.244.02

Fundamental laws and definitions in physics. II. Specific heat and Newton's law of cooling. HANSEL, C. W. *Proc. Phys. Soc., Lond.*, 54, *pp.* 159–164, *March*, 1942.—Comments on Newtonian cooling, with remarks on the suitability of numerical cooling data for inclusion in examination questions; it is recommended that certain popular questions of this type should be eliminated on account of the inexactitude of the "law"—or the measurements commonly taken to verify it. G. F. F.

2103 536.632

The specific heats of morpholine and its aqueous solutions. TRIMBLE, H. M., ENGLE, C. J., BROWN, R. A., AND SCHMUCK, R. F. *J. Amer. Chem. Soc.*, 64, *pp.* 679–681, *March*, 1942.

See Abstr. 2056 536.633.4 : [534.37 + 534.22

2104 536.653

Heats of mixing in the ternary system ethanol–acetic-acid–ethyl-acetate by a rapid approximate method. LONGTIN, B. *J. Phys. Chem.*, 46, *pp.* 399–405, *March*, 1942.—Heats of mixing may be measured consistently to an accuracy of within 5 joules/mole using ordinary pyrex test tubes and thermometers graduated in tenths of a deg. C. Care must be taken to have the liquids substantially at the steady temperature of the room at the instant before mixing, and the heat capacity of the apparatus must be considered.

2105 536.7

Thermodynamic properties of air. GERHART, R. V., BRUNNER, F. C., MICKLEY, H. S., SAGE, B. H., AND LACEY, W. N. *Mech. Engng, N.Y.*, 64, *pp.* 270–272, *April*, 1942.

2106 536.7 : 533.75 : 539.133

Second virial coefficients and the forces between complex molecules. HIRSCHFELDER, J. O., MCCLURE, F. T., AND WEEKS, I. F. *J. Chem. Phys.*, 10, *pp.* 201–211, *April*, 1942.—The second virial coeff. of ethane, propane, *n*-butane, *n*-heptane, ammonia, methyl chloride and the freons, are computed from available experimental data. At temperatures above the critical, the second virial agrees with the theorem of corresponding states. Below the critical temperature, molecules with dipoles have unusually large virials and the values of their reduced dipole moment determine the discrepancy. The equilibrium const. for the formation of double molecules is related to the second virial and its temperature variation gives the entropy and the energy of their formation. A corresponding-states equation is given for estimating second virials when no experimental data are available.

See Abstr. 2176 536.7 : 541.134

2107 536.712

The compressibility of and an equation of state for gaseous isobutene. BEATTIE, J. A., INGERSOLL, H. G., AND STOCKMAYER, W. H. *J. Amer. Chem. Soc.*, 64, *pp.* 548–550, *March*, 1942.—[See Abstr. 2578 (1939)].

2108 536.75 : 532.14

The entropy of vaporization and density of liquids at their boiling points. SIMONS, J. H., AND SMITH, R. K. *J. Phys. Chem.*, 46, *pp.* 380–387, *March*, 1942.

ELECTRICITY. MAGNETISM

See Abstr. 2175 537.226.1 : 541.127

2109 537.226.1 : 621.3.011.5 : 621.317.76

An alternating-current apparatus for measuring dielectric constants. HUDSON, B. E., AND HOBBS, M. E. *Rev. Sci. Instrum.*, 13, *pp.* 140–143, *April*, 1942.—[Abstr. 1106 B (1942)].

2110 537.226.2

Dielectric studies on muscle haemoglobin. MARCY 3RD, H. O., AND WYMAN, JR., J. *J. Amer. Chem. Soc.*, 64, *pp.* 638–643, *March*, 1942.—The dielectric properties of a 2·31% aqueous solution of horse myglobin were determined from 1·76 to 15 Mc./s. The method employed is based on the use of a c.r.o. and gives both real and imaginary components of the dielectric const.

2111 537.226.2 : 539.133

Electric moments of inorganic halides in dioxane. I. Phosphorus, arsenic and antimony trihalides. MCCUSKER, P. A., AND CURRAN, B. C. *J. Amer. Chem. Soc.*, 64, *pp.* 614–617, *March*, 1942.—Dielectric const. and densities are reported for dioxane solutions of phosphorus trichloride, phosphorus tribromide, arsenic trichloride, arsenic tribromide, arsenic triiodide, antimony trichloride and antimony tribromide. The $\Delta\varepsilon/C_2$ ratios for the dioxane solutions of the phosphorus trihalides decrease with increasing solute conc. The electric moments determined for the arsenic and antimony trihalides indicate that coordination in dioxane solution occurs to a greater extent with antimony than with arsenic.

2112 537.226.2 : 541.135.6

Electrode polarization in dielectric-constant measurements. SMILEY, W. G., AND SMITH, A. K. *J. Amer. Chem. Soc.*, 64, *pp.* 624–628, *March*, 1942.—An apparatus is described for conductance and capacitance measurements on conducting solutions from 1 kc./s. to r.f. Results are given on the polarization capacitance of Pt electrodes in very dilute solutions of H_2SO_4, H_2CO_3, and HCl, alone and with glycine, gelatin and acetone. In the range from 1 to 30 kc./s. the polarization capacitance does not follow the "inverse square root law." An empirical equation is given. Polarization capacitance increases with decreasing *p*H.

2113 537.226.2 : 541.182.6 = 3

Dielectric measurements on suspensions of pigments in linseed oil. WACHHOLTZ, F., AND FRANCESON, A. *Kolloid Z.*, 93, *p.* 234, *Nov.*, 1940.—Concerning origin and patent rights of a method previously described [Abstr. 638 (1941)]. R. N.

2114 537.311.2 : 532 = 3

Is the hydraulic analogy permissible? MOELLER, F. *ETZ* [*Elektrotechn. Z.*], 63, *pp.* 139–140, *March* 26, 1942.—Some of the differences between the flow of water and of electrons are discussed in order to show the limitations of the hydraulic analogy frequently used for didactic purposes in explaining electric phenomena. R. N.

2115 537.311.2 : 621.3.011.2

Fundamental laws and definitions in physics. I. Ohm's law. HANSEL, C. W. *Proc. Phys. Soc., Lond.*, 54, *pp.* 151–159, *March*, 1942.—[Abstr. 1015 B (1942)].

See Abstr. 2152 537.311.3 : 531.754 : 536.4 : 621.318.22 : 539.24

See Abstr. 2192 537.311.3 : 532.13 : 541.182.6

2116 537.312.6 : 536.531

Electrical conduction in the glass insulation of resistance thermometers. HOGE, H. J. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 489–498, *April*, 1942.—At temperatures above 350°C. electrical conduction may become troublesome in the glass through which the leads of certain types of resistance thermometers are sealed. Conduction in these seals is rapidly reduced by polarization of the glass, and the error in temperature measurement resulting from conduction in the glass may be reduced by adopting a measuring schedule which takes full advantage of this polarization.

2117 537.361

Structure and capacitance of electrical double layer. BIKERMAN, J. J. *Phil. Mag.*, 33, *pp.* 384–397, *May*, 1942.—A theory of the structure of the diffuse double layer is advanced, based on dipole properties or dielectric const. of ions and solvent. The theory is applied to the capacitance of mercury-solution interfaces, and accounts for the general shape of capacitance/potential curves, including the max. at low potentials in conc. solutions, the position of this max., and the nearly const. capacitance at high potentials.

2118 537.52

Discharge phenomena in gases. LUNT, R. W., ENGEL, A. VON, AND MEEK, J. M. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 338–367, 1942.—The first section deals with the statistical theory of reactions in gases maintained in a state of partial ionization, and with the implications of this theory to the general understanding of the mechanism of discharges. A detailed discussion is given of recent developments which attempt to trace the relationship between average quantities, such as reaction rate coefficients, to the data for individual collisions between the species present which engender reaction in partially ionized gases. The second section discusses the mechanism of the negative zones in glow discharges, especially the factors controlling the cathode fall of potential. Recent attempts to improve the theory of the cathode fall are considered. The third section is concerned with the rapidly changing phases of partial ionization which culminate in a spark in a gas under conditions such that pressure × gap-length exceeds 200 mm.Hg.cm. It is shown that ionization by positive ions can no longer be considered the factor which causes breakdown. The more recent theory, according to which breakdown is to be explained mainly in terms of ionization by electrons and photon impact with the gas molecules, together with the resultant field distortion by space charge, is described. A comprehensive bibliography is appended. A. M. T.

2119 537.523.2

The distribution of autelectronic emission from single crystal metal points. II. The adsorption, migration and evaporation of thorium, barium and sodium on tungsten and molybdenum. BENJAMIN, M., AND JENKINS, R. O. *Proc. Roy. Soc. A*, 180, *pp.* 225–235, *June* 5, 1942.—[See Abstr. 3016 (1940)]. Migration

occurs at relatively low temperatures, and for an optimum thermionic covering there is a unique distribution of the migrating atoms on the metal crystal. Certain crystal zones are avoided by the migrating atoms. The atoms evaporate more readily from certain crystal zones, and the differences in the temperatures for complete migration and evaporation of the atoms lead to an explanation of why migration is not always observed with Ba and is always observed with Th on multicrystalline surfaces. Diffusion of Th occurs through the crystal lattice along certain preferred directions and the final distribution is identical with that obtained by depositing Th from an external source.

See Abstr. 2079 537.525.72 : 535.33.03 : 535.338.332

2120 537.525.8

Further studies on active nitrogen. III. Experiments to show that traces of oxygen or other impurity affect primarily the walls of the vessel, and not the phenomena in the gas space. RAYLEIGH, LORD. *Proc. Roy. Soc. A*, 180, *pp.* 123–139, *June* 5, 1942.—[See Abstr. 3194 (1940)]. The action of oxygen must be on the walls of the tube: for when a minute O tributary is added to the N stream, it takes much longer to assert its action than the time required to establish the changed composition of the gas stream; and similarly, when the O tributary is checked, its activity persists for a time. This is interpreted to mean that the action of the O or other impurity is to modify the glass wall in a way favourable to the accumulation of active N. The restoration of the afterglow by addition of a tributary stream of O can be observed with electrodeless discharge at l.p. (0·3 mm.). The paper examines how various treatments of a glass vessel affect its action on the afterglow. Heating *in vacuo* makes it destructive of the glow. Heating in N at atm. pressure does the same. Heating in O, even at 1 mm. pressure, restores it. The behaviour of glass is therefore very complex, and not likely to be easily unravelled.

2121 537.525.8 : 537.56

Further studies on active nitrogen. IV. The ionization associated with active nitrogen. RAYLEIGH, LORD. *Proc. Roy. Soc. A*, 180, *pp.* 140–150, *June* 5, 1942.—The ionization associated with afterglowing N is examined. This ionization is completely cut off if the testing vessel is separated from the afterglow by a silica wall. The ionization cannot therefore be directly produced by light, at any rate within the range from λ1 850 to the visible. No increased current is observed when the surface action of the active gas is so vigorous as to make the testing cathode (of gold) red hot. The ionization is in general nearly the same when the cathode of the testing vessel is one of the common metals or a surface coated with metaphosphoric acid. Copper, however, is an exception. Comparisons are made of the number of ion pairs generated, and the number of photons emitted, per cm.^{3} at various stages as the glow dies down. It is found that the admission of inert N which is known to increase the (instantaneous) emission of photons, also increases the (instantaneous) ionization. The ionization of N requires 15·51 V, and the presence of this ionization seems to throw much doubt on the attempts to calculate the energy of active N from the band spectrum emitted, which suggests an energy of 9·6 V.

See Abstr. 2157 537.533.72 : 539.26

2122 537.534 : 621.385

Canal-ray positive-ion sources. CRAGGS, J. D. *Proc. Phys. Soc., Lond.*, 54, *pp.* 245–265, *May*, 1942.—The paper deals with output from cold-cathode glow discharge tubes with a canal drilled through the cathode. The importance of obtaining large canal-ray currents for h.v. positive-ion bombardment work is stressed, and a brief preliminary discussion of previous work given. The reasons for adopting canal-ray sources are discussed. The necessity for using a low gas output is stressed, and the effect on yield of varying the canal-flow impedance is studied. Total ion currents up to 2 mA were obtained. The presence in the canal-ray beam of large numbers of neutral particles was shown by an experiment on electrostatic deflection of the rays after leaving the canal. The final part of the paper deals with magnetic deflection of the beam and its analysis into different groups of ions. This work was done with a h.v. cascade acceleration tube, and qualitative data on collision processes in molecular hydrogen are given.

See Abstr. 2121 537.56 : 537.525.8

2123 537.591 : 621.396.933

A cosmic-ray radio sonde. NEHER, H. V., AND PICKERING, W. H. *Rev. Sci. Instrum.*, 13, *pp.* 143–147, *April*, 1942.—[Abstr. 971 B (1942)].

2124 537.591.15

The "second maximum" of the shower transition curve of cosmic radiation. GEORGE, E. P., JÁNOSSY, L., AND MCCAIG, M. *Proc. Roy. Soc. A*, 180, *pp.* 219–224, *June* 5, 1942.—Various observers have reported, besides the well-established first max. of the Rossi transition curve, a second max. for larger thicknesses of absorbers. Measurements of the Rossi curve, carried out with various counter systems, are reported. None of these measurements shows any indication of a second max. A spurious max. can be obtained under certain circumstances.

2125 537.591.5 : 550.385

Cosmic rays and magnetic storms. DUPERIER, A. *Nature, Lond.*, 149, *pp.* 579–580, *May* 23, 1942.—Records observations in Kensington, March, 1941.

2126 537.72–32 : 621.317.33

A review of methods for the absolute determination of the ohm. CURTIS, H. L. *J. Wash. Acad. Sci.*, 32, *pp.* 40–57, *Feb.* 15, 1942.—[Abstr. 1097 B (1942)].

2127 537.726 : 531.787.9 = 3

Measurement of the characteristic frequency of piezo-electric pressure meters. GOHLKE, W. *VDI* [*Z. Ver. dtsch. Ing.*], 84, *pp.* 663–666, *Sept.* 7, 1940.—It is shown theoretically and experimentally that the characteristic frequencies of piezo-electric apparatus should be measured using a small mass instead of a heavy bar for initiating the oscillations. R. N.

2128 538.214

Magnetic susceptibilities of *cis* and *trans* decalin. BYERLY, W., AND SELWOOD, P. W. *J. Amer. Chem. Soc.*, 64, *pp.* 717–718, *March*, 1942.

2129 538.32 : 621.3.013

An experiment with the current pendulum. BAR-

TUNEK, P. F. *Amer. J. Phys.*, 10, *pp.* 16–19, *Feb.*, 1942.—[Abstr. 1020 B (1942)].

See Abstr. 2057 538.652 : 534.322.3 : 621.3.042.2 : 621.314.21

2130 538.652 : 621.318.22

Magnetostriction in electrical sheet steels. BRAILSFORD, F., AND MARTINDALE, R. G. *J. Instn Elect. Engrs*, 89, *Part I*, *pp.* 225–231, *May*, 1942.—[Abstr. 1111 B (1942)].

MOLECULAR AND ATOMIC PHYSICS

2131 539.132

The approximate solution of Schrödinger equations by a least-squares method. FROST, A. A. *J. Chem. Phys.*, 10, *pp.* 240–245, *April*, 1942.—A method is developed in which variation functions are used but no integrations are involved. The procedure involves the evaluation of the energy for a set of representative points in configuration space. The parameters in the variation function are then chosen by applying the condition that the mean square deviation of the energy from the average should be a min.

2132 539.133

The magnitude of the solvent effect in dipole-moment measurements. V. The solvent-effect constant and the moments of alkyl iodides. AUDSLEY, A., AND GOSS, F. R. *J. Chem. Soc.*, *pp.* 358–368, *May*, 1942.—The solvent-effect const. is defined, and its relationship to molecular structure summarized. The moments and the solvent-effect const. of the alkyl iodides fall into regular series, primary, secondary and tertiary, the primary being modified by an alternation of the odd and even members. The moments in each series exhibit a decrement of 0·01 D for each member of the series, this being modified by systematic differences attributable in the case of the lowest members to induced moments. It is deduced that alkyl chains in the liquid phase are curled, whereas in the vapour phase they are free to rotate. In the series Me, Et, Pr^{β}, Bu^{γ} the induced moments can be calculated from a group dipole moment of 0·64 for the methyl group.

See Abstr. 2106 539.133 : 533.75 : 536.7

See Abstr. 2111 539.133 : 537.226.2

2133 539.152.1

Symmetry properties of nuclear levels. WIGNER, E. P., AND FEENBERG, E. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 274–317, 1942.—Theories of nuclear structure are developed on the lines of the quantum theory of spectroscopy. The approx. position of the lowest level can be predicted by methods involving consideration of symmetry properties, but the higher levels must be derived by methods similar to those used in obtaining electronic levels. A. J. M.

See Abstr. 2051 539.155.2 : 533.7 : 533.15

2134 539.16.08

Detection of radon by means of a proportional counter. BROWN, S. C., ELLIOTT, L. G., AND EVANS, R. D. *Rev. Sci. Instrum.*, 13, *pp.* 147–151, *April*, 1942.—The detection of quantities of radon of the order 10^{-12} curie is discussed. Two methods are investigated. In one the radon is concentrated in a liquid-air trap before it is put into the counter, and in the other the volume of the counter is made sufficiently large so that the radon can be swept into the counter with inert gas.

2135 539.16.08

A one-tube quenching-recording circuit for G–M counters. COVEN, A. W. *Rev. Sci. Instrum.*, 13, *pp.* 188–189, *April*, 1942.

2136 539.17 : 541.634

Chemical effects of the nuclear isomeric transition in bromine; evidence for atomic bromine and some of its properties. DEVAULT, D., AND LIBBY, W. F. *J. Amer. Chem. Soc.*, 63, *pp.* 3216–3224, *Nov.*, 1941.—The isomeric transition from 4·5 hr. to 18 min. $\frac{1}{2}$ life in Br^{80} usually induces a shower of electrons from the Br atom. Experiments are described leading to the following conclusions: if the molecule containing the Br atom is in a gaseous state it is decomposed by the resulting large positive charge on it. The ejected 18 min. Br atom is quickly neutralized by electron transfer on collision with neutral molecules and ends up as HBr, Br or free Br atoms. The latter form in appreciable numbers with long life because of low conc., appear not very soluble in H_2O or conc. H_2SO_4, and do not react readily with organic compounds such as C_2H_5Br. In the liquid phase, substitution reactions occur. Alcohol or aniline acts to release the 18 min. Br in inorganic form. The mechanism of these reactions is discussed. N. M. B.

2137 539.185

Neutron beam monitor. FRYER, E. M., AND STAUB, H. *Rev. Sci. Instrum.*, 13, *pp.* 187–188, *April*, 1942.

2138 539.211

The interpretation of thermal endurance tests on glass containers. MURGATROYD, J. B. *J. Soc. Glass Technol.*, 26, *pp.* 22–34 (*T*), *Feb.*, 1942.

See Abstr. 2160 539.214 : 539.382

2139 539.214 : 679.51 = 3

On the effect of plasticizers on the mechanical properties of celluloid. WADANO, M. *Kolloid Z.*, 93, *pp.* 103–109, *Oct.*, 1940.—[See Abstr. 1146 (1941)]. The present investigations are concerned with dibutylphthalate or castor oil used as plasticizers for nitrocellulose. In the case of castor oil there exists only a solid solution of limited solubility, while with camphor or dibutylphthalate new molecular complexes are formed which may give solid solutions of a certain solubility with both components. It depends largely on the properties of this molecular complex whether the system is more plastic or more elastic. It is assumed that, in the complex formed with the phthalate, the main valency chain is not straight but forms a spiral similar to that in rubber. R. N.

2140 539.215.2 : 541.18.045.2 : 66.067

Clarifying efficiency of diatomaceous filter aids. CUMMINS, A. B. *Industr. Engng Chem.*, 34, *pp.* 403–411, *April*, 1942.—The rôle of filter aids in "clarification filtrations," and some of the relations between several types of filter aids and different kinds of suspended particles, are considered. Data are presented to show the correlation between the particle size and shape and other properties of a number of diatomaceous silica products, and the results obtained in the

filtration of liquids containing suspensoid or emulsoid particles of different types. Some relations for filter aids are shown by calculations of particle size, specific surface, cake porosity, etc., and by comparison of the results obtained in the filtration of particles of known character and particle size. Filtration tests made with simple dispersed systems, such as carbon black, metallic oxides, wax emulsions, latex, etc., emphasize some of the complicated relations between the type of filter aid employed and the degree of clarification obtained. H. H. HO.

2141 539.215.2 : 541.18.045.2 : 66.067

Diatomaceous silica filter-aid clarification. ELSENBAST, A. S., AND MORRIS, D. C. *Industr. Engng Chem.*, 34, *pp.* 412–418, *April*, 1942.—The mechanical application of diatomaceous silica filter aids and the equipment in which they are used are discussed for the benefit of the man in the factory. First the selection of filter aid receives consideration, then filter station equipment, cane sugar factories and refineries, filter operations, re-use of filter aids, and beet sugar factories are described. H. H. HO.

2142 539.215.2 : 77

A theory of graininess. SELWYN, E. W. H. *Photogr. J.*, 82, *p.* 208, *May*, 1942.—A new form of the earlier part of the argument given previously is outlined. [Abstr. 162 (1936)].

2143 539.215.4 : 541.182.6 : 632.94

Particle size in relation to insecticide efficiency. SMITH, C. M., AND GOODHUE, L. D. *Industr. Engng Chem.*, 34, *pp.* 490–493, *April*, 1942.—A number of solid insecticides have been separated by various workers into fractions of different particle size, and toxicity tests have shown the smaller particles to be, in general, the more effective. In the case of oil emulsions droplet size is important, but no clear generalizations can be drawn. With oil sprays the quantity of oil appears to be more important than the size of the droplets. Solids and liquids can both be applied in aerosol form, and the degree of fineness and stability of such aerosols can be improved by means of protective smokes and surface-active agents to the point where many new fumigants may be developed.

2144 539.215.9

Some properties of the dry air-setting type of refractory bonding mortar. HEINDL, R. A., AND PENDERGAST, W. L. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 401–416, *April*, 1942.—Seventeen brands of air-setting refractory mortars of the type marketed in the dry condition were investigated in the unheated state with regard to tempering water, fineness of grain, soluble alkali content, pyrometric-cone equivalent, suitability for trowelling and dipping, drying and setting properties and strength. After heat treatments at various final temperatures the strengths of the mortars were determined. In rupturing assemblages of 2 half-brick and mortar, the types of failure were noted. The tendency of the mortars to shrink, crack and flow when exposed to high temperatures, both in fusion blocks and in units of three brick each, was also investigated.

2145 539.216

Dispersion of cellulose strands in cell walls. PRESTON, R. D. *Nature, Lond.*, 149, *pp.* 580–581, *May* 23, 1942.

2146 539.216 : 541.68 : 677.31 = 3

On the structure of wool and its reactivity. ELÖD, E., NOWOTNY, H., AND ZAHN, H. *Kolloid Z.*, 93, *pp.* 50–66, *Oct.*, 1940.—The part played by the disulphide bridges in cystine is investigated with a view to examining their importance for the high stability of the wool substance. By treatment with Hg and other chemical reagents it was proved that the disulphide bridges may be interrupted without materially injuring the mechanical properties. The *p*H value at which the reactions take place is important. The high constancy is attributed to the laminar structure and the grate formation between main chains and "backbone." Supercontraction and temporary and permanent set are discussed. A bibliography is given. R. N.

2147 539.216.1 : 661.713 = 3

Ultramicroscopic investigations on the decomposition of cellulose fibres. RUSKA, H., AND KRETSCHMER, M. *Kolloid Z.*, 93, *pp.* 163–166, *Nov.*, 1940.—The investigations are concerned with the decomposition of the cellulose fibre under the influence of HCl or when precipitated from a solution in cupric oxide and ammonia (Cuoxam). Besides amorphous structures similar to those found in the interior of the fibre [Abstr. 920 (1941)], thread-like forms are discernible of the size of cellulose micelles and probably originated at the outer zones of the fibre. The investigations show that the structure elements described by Farr [Abstr. 2334 (1937)] form only part of the decomposition products of the fibre. R. N.

2148 539.216.2

Rate of oxidation of typical non-ferrous metals as determined by interference colours of oxide films. MCADAM, JR., D. J., AND GEIL, G. W. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 593–635, *May*, 1942.—By means of interference colours the rates of oxidation were determined for 18 non-ferrous metals and were compared with those for typical steels. The influence of temperature, oxidation time, and film thickness on the rate of oxidation is illustrated by projections of surface in 3-dimensional diagrams. For a const. film thickness, the relation between temperature and oxidation time is linear logarithmic. The variation of film thickness with either temperature or oxidation time, plotted logarithmically, is represented by a reversed curve. A discussion is given of the influence of the affinity of the metal or oxygen and of the rate of diffusion through the oxide film. The film behaves as if the sp. resistance varies non-linearly with the film thickness.

2149 539.216.2

Elimination of oxide films on ferrous materials by heating in vacuum. HOLM, V. C. F. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 569–579, *May*, 1942.—Investigation of the mechanism by which lightly oxidized specimens of ferrous materials were brightened when heated in vacuum showed that the presence of carbon was essential. Oxidized specimens of iron containing small amounts of carbon were brightened in 15 to 20 min. at 800°C., and the elimination of the oxide film was accompanied by decreases in the carbon content. Clean-up of oxide films on stainless steel occurred also when the specimens were heated to about 1 050°C. Oxidized high-purity iron which con-

tained less than 0·001% of carbon could not be brightened by vacuum heating at temperatures up to 1 250°C. Vacuum heating of lightly oxidized specimens of high-purity iron sometimes caused the oxide film to agglomerate, forming distinct, geometric patterns that could be observed under the microscope.

See Abstr. 2031 539.217.1 : 531.754

See Abstr. 2053 539.217.1 : 534.64 : 533.17

2150 539.217.3

Improved instrument for measuring the air permeability of fabrics. SCHIEFER, H. F., AND BOYLAND, P. M. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 637–642, *May*, 1942.—The air, which is drawn through the fabric by a given suction, is measured with orifice-type flowmeters. The calibration and operation of the instrument are discussed. Results of measurements on two very different types of fabrics—parachute cloth and blankets—are given for several methods of clamping. A suitable method is described for which the edge leakage is negligible.

2151 539.219.2

Stress systems in aeolotropic plates. IV. GREEN, A. E. *Proc. Roy. Soc. A*, 180, *pp.* 173–208, *June* 5, 1942.—[See Abstr. 34 (1940)]. Stress distributions in an aeolotropic plate containing a circular hole are discussed theoretically when the material of the plate has 2 directions of symmetry at rt. angles to one another. Examples of stress distributions are included which have non-zero force resultants on the edge of the hole, corresponding to cases in isotropic materials for which the solution is dependent on Poisson's ratio. Numerical work is carried out using the elastic constants found in experiments with specimens cut from the highly aeolotropic materials spruce and oak.

2152 539.24 : 531.754 : 536.4 : 537.311.3 : 621.318.22

Properties of high-purity iron. CLEAVES, H. E., AND HIEGEL, J. M. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 643–667, *May*, 1942.—Results are recorded of new determinations of the workability, microstructure, density, and the thermal, mechanical, electrical and magnetic properties of high-purity iron, in which the max. amount of an individual impurity was 0·004% and the total of impurities in any specimen was 0·01% or less.

2153 539.24 : 620.19

Structural changes in the bonding layer of soft-soldered joints in copper pipe lines on long-continued heating. SWANGER, W. H., AND MAUPIN, A. R. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 479–487, *April*, 1942.—Joints made with solder containing tin are susceptible to change if the service involves use at elevated temperatures, whereas many lead-base solders are not. By metallographic studies of specimens cut from soldered joints held at elevated temperature for long periods, the nature of the microstructural change was established, and correlated with the lowering of the bonding properties of the soldered joint. This consists in the formation of a bonding layer adjacent to the copper base by alloying, by diffusion, of the tin of the solder and the adjacent copper. Micro-hardness determinations showed this constituent to be much harder than the initial solder and also harder than the copper base. Evidence of brittleness was also found.

2154 539.24 : 621.385.833 = 3

Use of cold-cathode c.r. oscillograph for microstructure investigation and absolute measurements by electron diffraction. INDUNI, G. *Schweiz. Arch. angew. Wiss. Techn.*, 8, *pp.* 35–45, *Feb.*, 1942.—[Abstr. 1139 B (1942].

2155 539.26

The diffraction of X-rays by liquid benzene-cyclohexane mixtures. EISENSTEIN, A., AND GINGRICH, N. S. *J. Chem. Phys.*, 10, *pp.* 195–199, *April*, 1942.—Both the photographic method and the Geiger–Müller counter method were used. The fine structure on the main peak, and a secondary peak, cannot be obtained.

2156 539.26

Long X-ray diffraction spacings of collagen. BEAR, R. S. *J. Amer. Chem. Soc.*, 64, *p.* 727, *March*, 1942.

2157 539.26 : 537.533.72

Orientation of micelles in soap fibres. ROSS, S. *J. Phys. Chem.*, 46, *pp.* 414–417, *March*, 1942.—The oriented nature of the soap fibres photographed by the electron microscope is pointed out, and a correlation is sought between this orientation and that revealed by X-ray diffraction photographs.

ELASTICITY. STRENGTH

2158 539.377

Physical properties of polystyrene as influenced by temperature. CARSWELL, T. S., HAYES, R. F., AND NASON, H. K. *Industr. Engng Chem.*, 34, *pp.* 454–457, *April*, 1942.—The tensile, flexural, impact and hardness properties of injection-moulded polystyrenes of several mol. wt. ranges were investigated at temperatures from − 75° to + 100°C. Injection-moulded polystyrene undergoes a critical transformation with respect to mechanical properties at 80° to 85°C. which is analogous to the second-order transition range of rubber at − 71° to − 67°C. Polystyrene becomes tougher as the ambient temperature is reduced below the transformation range, and differs in this respect from most cellulose ester or ether plastics which generally are more brittle at lower temperatures. Tensile strength, elongation and impact strength, increase as the average mol. wt. of the polymer increases. Indentation hardness appears to be independent of mol. wt. at temperatures below the transformation range.

2159 539.381 : 621.791 = 3

Deformation of steel girders welded on one side. MALISIUS, R. *VDI* [*Z. Ver. dtsch. Ing.*], 84, *pp.* 661–662, *Sept.* 7, 1940.

2160 539.382 : 539.214

Phase transition and elastic behaviour of high polymers. MARK, H. *Industr. Engng Chem.*, 34, *pp.* 449–454, *April*, 1942.—At very low stresses the van der Waals cohesion of the different segments in the curled-up chains is overcome, and the chains are brought into a more extended state. The kinetic elasticity of long-chain molecules is due to the fact that the extended state is less probable than a state of intermediate curl. While the alignment of the chains

takes place, molecular attraction between different chains causes crystallization. The crystallized phase has a certain amount of elasticity, characterized by a high elastic modulus.

2161 539.382 : 620.1

Tensile and compressive properties of some stainless-steel sheets. AITCHISON, C. S., RAMBERG, W., TUCKERMAN, L. B., AND WHITTEMORE, H. L. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 499–522, *April*, 1942.—Tensile and compressive tests were made on specimens from Cr-Ni (17–7 and 18–7) stainless-steel sheets, with cold-reductions from 0 (annealed) to 50%, and thicknesses from 0·01 to 0·06 in. The effect of a stress-relieving treatment at 300° C. for 24 hr. was investigated for one of the compositions. The results are given in tables and stress/strain curves. The effect of the degree of cold-reduction and of the stress-relieving treatment is discussed.

2162 539.4.01 : 539.52 : 539.54

The technical cohesive strength and yield strength of metals. MCADAM, JR., D. J. *Amer. Inst. Min. Metallurg. Engrs, Techn. Publ. No.* 1414, [47 *pp*], 1942.—In continuation of an earlier paper [Abstr. 865 (1942)], the effect of combinations of principal stresses on both the technical cohesion limit and the yield stress is studied, and reference is made to ductility and work-hardening capacity, which depend on the initial difference between the cohesion limit and the yield stress. The technical cohesive strength of a metal is found to comprise an infinite number of stress values corresponding to an infinite number of possible combinations of principal stresses. The flow stress and the cohesion limit increase continuously with plastic deformation, the flow stress increases more rapidly than the corresp. cohesion limit, and rupture occurs when the 2 curves intersect. Three-dimensional diagrams are given to represent the technical cohesive strength. A. C. W.

2163 539.4.016

The effect of zinc, nickel, lead and tin on the properties of L.3 alloy sheet. COOK, M., AND CHADWICK, R. *J. Inst. Met.*, 68, *pp.* 169–178, *May*, 1942.—Four series of alloys of normal L.3 composition, each with progressively increasing proportions of one of the elements Zn, Ni, Pb and Sn, have been prepared in sheet form and the properties have been examined. The annealing, heat-treatment and room-temperature-ageing characteristics of the alloys have been investigated, as well as the mechanical and corrosion-resisting properties after heat-treatment at 495°C., followed by room-temperature ageing. Only Ni has any substantial effect, and it progressively decreases the hardness, strength and ductility of the fully-aged material, whilst there is a decrease in resistance to corrosion with the higher proportions. Pb additions cause slight improvement in corrosion-resistance, and the larger Sn additions diminish the ductility slightly.

2164 539.4.019

The influence of temperature on the mechanical strength of glass. JONES, G. O., AND TURNER, W. E. S. *J. Soc. Glass Technol.*, 26, *pp.* 35–61(T), *Feb.*, 1942.—Measurements of the strength of glass laths under bending have been made on more than 2 000 specimens of drawn sheet glass approx. 0·25–0·29 cm. thick at temperatures from 20° to some 20 deg. below the softening point (M_g). The strength remained unaffected by temperature until about 30 deg.–40 deg. below the transformation point, 534°. Above this point the strength began to fall off, being reduced by about $\frac{1}{3}$ at the highest temperature at which experiments were practicable, namely about 20 deg. below M_g. The fractured surfaces exhibited the same characteristics at 580° as at 20°.

2165 539.433 : 620.1

The damping capacity of engineering materials. HATFIELD, W. H., STANFIELD, G., AND ROTHERHAM, L. *Trans. N.-E. Cst Instn Engrs Shipb.*, [41 *pp.*], *May*, 1942.—An electro-magnetic torsional damping machine was employed to determine the damping capacity of various steels, alloys, sintered materials and plastics, at various temperatures. Austenitic steels gave low damping values, low-carbon steel gave an intermediate value, while stainless steels containing 13% Cr gave high values. The results indicated that a hard chemical compound such as tungsten carbide has a low damping capacity, and that the Co in the sintered alloy is mainly responsible for the damping. Similarly, the cementite in carbon and alloy steels appeared to have little effect on the damping. There was some indication that the magnetic properties of the material had some connection with its damping characteristics. There was no definite general connection between damping capacity and temperature. A. C. W.

2166 539.434

Creep rates of cold-drawn nickel-copper alloy (monel metal). BENNETT, J. A., AND MCADAM, JR., D. J. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 417–437, *April*, 1942.—A description is given of new equipment for testing the creep of metals. Each specimen was used for a series of tests. The characteristic creep rate depends only on the stress and temperature, and is not affected by prior stresses or temperatures. The influence of stress on the rate of creep increases with increasing stress, while the influence of temperature on the rate of creep decreases with increasing temperature.

2167 539.501

The classification of the rheological properties of industrial materials in the light of power-law relations between stress, strain and time. BLAIR, G. W. S., AND CAFFYN, J. *J. Sci. Instrum.*, 19, *pp.* 88–93, *June* 14, 1942.—An empirical classification of rheological properties is discussed in the light of a power-law relation between stress, strain and time. Partial differentiations of stress, strain and time products with respect to stress and strain (but not to time) give expressions which tally comparatively well with the classification. Reasons are given for preferring the power-law treatment to the more usual process of dividing strains arbitrarily into recoverable and non-recoverable parts.

See Abstr. 2162 539.52 : 539.54 : 539.4.01

2168 539.536 = 3

The micro-hardness test. BERNHARDT, E. O. *VDI* [*Z. Ver. dtsch. Ing.*], 84, *pp.* 733–736, *Sept.* 28, 1940.—By combining the diamond pyramid of a hardness tester with the optical system of a metallographic microscope an apparatus is obtained for

determining hardness and strength of single crystals or of small surfaces with locally varying strength, without the necessity of exchanging the objective lens of the microscope or the pyramid. An auxiliary optical system in the rear lens of the objective allows of measuring the displacement of the pyramid under the action of the test pressure. The apparatus and its applications are described and illustrated, especially the investigation of surface treatment by steel sand blowers, of the strength of rolled screw threads, of the distribution of hardness in cartridge cases and in the guide wires of wire ball bearings. R. N.

2169 539.537

The influence of tin on alloy steels. Bolsover, G. R., and Barraclough, S. *J. Iron Steel Inst.*, [15 *pp.*], 1942. *Advance copy.*—The general effect of Sn on the properties of steels in the hardened and tempered condition and of Mo in counteracting that of a high Sn content is shown, and further data indicate the influence of Sn on the nitriding steel after a blank nitriding operation and on a case-hardening steel in the quenched condition.

See Abstr. 2162 539.54 : 539.52 : 539.4.01

2170 539.6

Amontons' law, "traces" of frictional contact, and experiments on adhesion. Schnurmann, R. *J. Appl. Phys.*, 13, *pp.* 235–245, *April*, 1942.—By Amontons' law the tangential frictional force between the macroscopically plane surfaces of various materials in air is directly proportional to the normal load and approx. independent of the nominal area of contact and the physical properties of the solids. Such a law only holds when the area which suffers tearing in frictional contact is small in proportion to the nominal area of contact. Extremely thin films of foreign matter between the high points of two solids in contact act as adhesives. "Traces" of sliding and rolling friction between various metals and glass in air have been studied and give a measure of the torn proportion of the area of contact. A. C. W.

2171 539.62

Friction between solid bodies. Schnurmann, R. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 71–89, 1942.—The molecular-beam method of investigating the roughness of a surface is described, and the mechanism of friction is discussed. Recent work on the temperature coeff. of static friction is described. The force of static friction and of sliding friction, and the jerky motion associated with the latter, are considered. Work on the temperature rise when one surface slides over another is described, and the conclusion is reached that there is no direct evidence for the existence of localized high temperatures on a metal surface. The variation of the coeff. of friction between 2 surfaces with the nature of the substance adsorbed is considered, particularly in connection with the adsorption of H_2O. A monomolecular film of H_2O has considerable adhesive properties.

A. J. M.

2172 539.62

Frictional properties of rubber. Roth, F. L., Driscoll, R. L., and Holt, W. L. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 439–462, *April*, 1942.—Laboratory measurements of coeff. of friction of soft rubber compounds were made by towing specimens on horizontal tracks and by allowing them to slide down inclined tracks. The specimens were prepared by attaching the rubber to a metal backing and moulding it against glass surfaces having different degrees of roughness. The coeff. increase with speed, from about 1 at 10^{-4} cm./sec. to more than 4 at 5 cm./sec. The occurrence of vibrations prevented observations at higher speeds. Static friction is $>$ dynamic friction for speeds $< 10^{-3}$ cm./sec. and $<$ dynamic friction for greater speeds. The coeff. decrease slightly with increasing pressures. Except at very low speeds the smoother surfaces yield the higher coeff.

PHYSICAL CHEMISTRY

2173 541.123.31

The ternary system lithium-chloride–dioxane–water. Lynch, C. C. *J. Phys. Chem.*, 46, *pp.* 366–370, *March*, 1942.—The 25°C. isotherm for the system lithium-chloride–dioxane–water is presented. The system shows immiscibility for mixtures of high dioxane content. A new solvate, $LiCl . H_2O . (C_2H_4)_2O_2$ was prepared and identified.

2174 541.124

The kinetics of the periodate oxidation of 1,2-glycols. II. Ethylene glycol, pinacol and *cis*- and *trans*-cyclohexene glycols. Price, C. C., and Knell, M. *J. Amer. Chem. Soc.*, 64, *pp.* 552–554, *March*, 1942.—The second-order rate const. for the oxidation of ethylene glycol, pinacol, and *cis*- and *trans*-cyclohexene glycols by aqueous periodate were determined over a considerable range in *p*H. The results are interpreted on the basis that the rate-controlling step of the oxidation is the formation of a cyclic diester of periodic acid.

2175 541.127 : 537.226.1

Dielectric and solvent effects on the iodide-persulphate reaction. Amis, E. S., and Potts, Jr., J. E. *J. Amer. Chem. Soc.*, 63, *pp.* 2883–2888, *Nov.*, 1941.—The reaction rate was studied at 20°, 30° and 40° in isodielectric and iso-composition $C_2H_5OH - H_2O$ media and also with various concentrations of added KNO_3. The salt effect did not vary markedly from the predictions of the Debye–Hückel limiting law. The energies of activation in presence of the neutral salt increased with increasing temperature and decreased with increasing ionic strength. The frequency factor varied similarly. An equation was derived for calculating the difference between critical increments measured in iso-composition media of given dielectric const. and those measured in isodielectric media of any specified dielectric const. Calculations based on the experimental data show that the electrostatic influences predominate.

N. M. B.

See Abstr. 2193 541.133 : 541.182.6

See Abstr. 2194 541.133 : 541.182.6.045.2

2176 541.134 : 536.7

The thermodynamics of aqueous solutions of potassium chloride at temperatures from 15°–45° from e.m.f. measurements on cells with transference. Hornibrook, W. J., Janz, G. J., and Gordon, A. R. *J. Amer. Chem. Soc.*, 64, *pp.* 513–516, *March*, 1942.—The e.m.f. of the cell with transference Ag,AgCl/KCl(m_1)//KCl(m_2)/AgCl,Ag was measured for conc.

up to 0·1 *M* from 15°–45°. Activity and osmotic coeff. were obtained for this range of temperature and conc.

2177 541.135.3 : 621.357.1

The electrochemistry of baths of fused aluminium halides. I. Aluminium as a reference electrode. VERDIECK, R. G., AND YNTEMA, L. F. **II. The deposition potentials of chromium, molybdenum and tungsten.** MARSHALL, E. E., AND YNTEMA, L. F. *J. Phys. Chem.*, 46, *pp.* 344–358, *March*, 1942.—[Abstr. 1129 B (1942)].

See Abstr. 2112 541.135.6 : 537.226.2

2178 541.138.3

Polarographic reduction of osmium tetroxide. CROWELL, W. R., HEYROVSKY, J., AND ENGELKEMEIR, D. W. *J. Amer. Chem. Soc.*, 63, *pp.* 2888–2890, *Nov.*, 1941.—Polarograms obtained in a study of the polarographic reduction of OsO_4 in a saturated solution of $Cu(OH)_2$ at 25° show three distinct waves and that the three steps in the reduction probably correspond, respectively, to

$$HOsO_5^- \rightarrow OsO_4^- + OH^-$$
$$OsO_4^- + 2H_2O \rightarrow OsO_2 + 4OH^-$$
$$2OsO_2 + H_2O \rightarrow Os_2O_3 + 2OH^-$$

The curve obtained with a saturated $Ca(OH)_2$ solution of K_2OsO_4 showed two waves corresponding to the last two of the above. N. M. B.

2179 541.141

The production of radicals by the illumination of diacetyl with λ 4 358 Å. ANDERSON, H. W., AND ROLLEFSON, G. K. *J. Amer. Chem. Soc.*, 64, *p.* 717, *March*, 1942.—[See Abstr. 2076 (1941)].

2180 541.141 : 771.54

Mercury sensitization and the optical and X-ray latent images. MAY, A. *J. Opt. Soc. Amer.*, 32, *pp.* 219–223, *April*, 1942.—In an attempt to obtain information about the X-ray and optical latent images a study is made of the mercury-sensitization of X-ray emulsions for exposure both to X-rays and visible light. It is found that either there is a reduction in slope of the characteristic curve, or there is no change. The effect of hypersensitization is found to vary markedly from test to test. A. H.

2181 541.141.11 : 771.54

The effect of temperature upon the spectral sensitivity of photographic emulsions. EVANS, C. H. *J. Opt. Soc. Amer.*, 32, *pp.* 214–219, *April*, 1942.—Spectral sensitivities at 3 different temperatures (approx. + 25°C., − 75°C. and − 185°C.) were determined for 7 commercial emulsions. For the 6 optically sensitized emulsions, the efficiency of sensitization decreased as temperature was lowered, except that for 3 of the emulsions this decrease commenced below − 75°C. Efficiencies at approx. − 185°C. ranged from 1/4 to 1/550 of their values at + 25°C.

2182 541.143 : 535.37

Reversible photochemical processes in rigid media: a study of the phosphorescent state. LEWIS, G. N., LIPKIN, D., AND MAGEL, T. T. *J. Amer. Chem. Soc.*, 63, *pp.* 3005–3018, *Nov.*, 1941.—The peculiar state, responsible for phosphorescence when a dye is illuminated in a homogeneous rigid solvent, has been studied theoretically and experimentally. Most of the experiments were made with fluorescein in boric acid glass. There are 2 emission bands (α and β) associated with 2 different processes by which the phosphorescent state may return to the normal state, and which are both unimolecular. The α-process obeys the Arrhenius equation, while 2 possible interpretations are given of the nature of the phosphorescent state and of the β-process. The heat of activation is 8 ± 1 kcal., which agrees with the spectroscopic value. A full energy diagram of the several states is given. With intense illumination, the phosphorescence approaches a max., and a new absorption spectrum appears which belongs to the phosphorescent state. By slight extrapolation the pure spectrum has been obtained. Excitation by light does not cause appreciable turning of the dye molecule in its rigid environment, and this leads to a new kind of dichroism from which the degree of orientation of the molecules in the phosphorescent and in the normal states have been calculated. H. H. HO.

2183 541.18 : 532.73

The migration of colloids through the interface between immiscible liquids under the influence of an electric field, and the formation of ultra-colloids. GIBSON, G. E., AND BALDWIN, L. *J. Chem. Phys.*, 10, *pp.* 247–248, *April*, 1942.

2184 541.18.041.5

The rate of nucleation of silver chromate in supersaturated solutions. HOOK, A. VAN, AND AHLBORN, J. C. *J. Phys. Chem.*, 46, *pp.* 395–399, *March*, 1942.—A previously implied equation [Abstr. 1744 (1941)] for the rate of nucleation of silver chromate in its precipitation from solution is experimentally justified. For the purpose of explaining the Liesegang-ring phenomenon of rhythmic precipitation this equation may be taken as valid.

2185 541.18.043

Analytical cell for the ultracentrifuge. ROSENFELD, M. *Rev. Sci. Instrum.*, 13, *pp.* 154–157, *April*, 1942.—An analytical cell has been designed for the angle-type quantity rotor of the air-driven ultracentrifuge. Sieve-like partitions covered with filter paper separate the cell into 2 or 3 compartments from which fractions can be removed for chemical analysis or for bio-assay. Fourteen tubes each containing 4·5 cm.^{3} of solution can be run simultaneously. Equations have been derived for the calculation of sedimentation const. from the analytical data.

2186 541.18.043 : 66.06

High-speed centrifuging. BEAMS, J. W. *Rep. Phys. Soc. Progr. Phys.*, 8, *pp.* 31–49, 1942.—A review of the principal theoretical and experimental advances during recent years. The former consist in the derivation of the relations between the amount of sedimentation in dilute idealized solutions and the physical and chemical properties of the solvent and solute, together with the derivation of the relations for the separation of gases. Experimentally, the advances have been made mainly by increasing the effective centrifugal field and in preventing re-mixing of the material during the centrifuging process by vacuum-type machines. A very complete account of applications concludes the paper. H. H. HO.

2187 541.18.045.2 : 628.16

Micro-straining: a new development in water purification. I–II. BOUCHER, P. L. *Engineer, Lond.*, 173, *pp.* 420–422, *May* 22, *and pp.* 445–447, *May* 29, 1942.—It is pointed out that much of the suspended matter in natural and industrial waters is in such a fine state of division that special filters must be devised. The production of a micro-straining medium, flow capacity of micro-straining cloth, corrosion resistance of such cloth, and a model rotary strainer, are discussed. The results of various straining tests are given. H. H. HO.

See Abstr. 2140, 2141 541.18.045.2 : 66.067 : 539.215.2

2188 541.182 : 532.612

Surface tension of micelle-forming solutions. CASSEL, H. M. *J. Chem. Phys.*, 10, *p.* 246, *April*, 1942.

2189 541.182.5 : 541.64

Molecular size distribution in three-dimensional polymers. I. Gelation. II. Trifunctional branching units. III. Tetrafunctional branching units. FLORY, P. J. *J. Amer. Chem. Soc.*, 63, *pp.* 3083–3100, *Nov.*, 1941.—A diagrammatic scheme is given for representing the structure of a 3-dimensional polymer in a way which facilitates statistical analysis. It is shown that the condition for the formation of infinitely large molecules is $\alpha > 1/(f-1)$, where f is the functionality of the branch units and α is the probability of chain branching as opposed to chain termination. Methods are given for calculating α from the number of branching units, the ratio of the 2 types of reactants (e.g. OH and COOH), and the extent of the reaction. Many smaller molecules are interspersed with the giant networks. The results support the hypothesis that gelation is the result of the formation of infinitely large molecules. It is assumed that the polymer is formed through random linking together of bi- and tri-functional units, and that no intramolecular reactions occur in molecular species of finite size. The statistical analysis shows that, although increasing quantities of complex species are formed as the reaction proceeds, simple single chains (containing no branch units) are always in abundance. The simultaneous presence of sol and gel after gelation is the consequence of random distribution of branch units in the polymer, and is in no way dependent upon different chemical properties of the ingredients from which the sol and gel functions are formed. The distribution of species in 3-dimensional polymers composed of randomly cross-linked chains of uniform length is discussed. H. H. HO.

2190 541.182.6

Equilibria and changes in metal hydroxide sols. BASSETT, H., AND DURRANT, R. G. *J. Chem. Soc.*, *pp.* 277–303, *April*, 1942.—Hydroxide sols of Al, Cr, Fe^{III}, La, Nd and Th are studied from the standpoints of the nature of the stabilizing ion and of the changes on ageing. Chemical methods for determining the free and bound cations in the positive sols are discussed. The chief factors determining whether a crystalline basic salt is formed are (1) the tendency for the metal hydroxide to co-ordinate with metal ions, and (2) the solubility and crystallizing capacity of the potential basic salt. Ageing of metal hydroxide sols is attributed to (i) coalescence of the liquid micelles to form larger droplets, or (ii) dehydration of the hydroxide constituent of the liquid micelles, or (iii) crystallization of the hydroxide either before or after dehydration, or (iv) crystallization of the basic liquid or glassy micelle as a definite basic salt, or its passage into true solution. In aqueous sols with liquid micelles the bound cations are of 2 types, (*a*) in solution in the micelle, (*b*) adsorbed on the surface with equivalent anions in the electrical double layer. H. H. HO.

2191 541.182.6 : 532.13 = 3

A new method for determining viscosity at high thrusts and given shearing speeds. WACHHOLTZ, F., AND ASBECK, W. K. *Kolloid Z.*, 93, *pp.* 280–297, *Dec.*, 1940, *and* 94, *pp.* 66–81, *Jan.*, 1941.—The theoretical and practical principles of measuring viscosity by the capillary and the cylinder methods are reviewed, and the apparent viscosity coeff. of anomalous liquids is defined as being dependent on shearing speed. A novel appliance is described and illustrated, consisting of a thin flexible band moved between 2 metal jaws fixed at a small adjustable distance from one another. This is used for measurement on pigment-oil suspensions. The apparent viscosity corresp. to infinite shearing speed is defined and its values are found by extrapolation. The form of the curve representing the log of apparent viscosity as a function of the volume percentage of pigments is independent of the viscosity of the oil and characteristic for the form of the pigment particles. For suspensions of equal pigment content the log of the viscosity coeff. at infinite shearing speed is $\propto$ the corresponding log for the oil. These relations apply to ordinary and boiled linseed as well as to mineral oil. R. N.

2192 541.182.6 : 532.13 : 537.311.3

Viscosity of certain "ferric oxide" hydrosols. GREENSTEIN, L. M., AND THOMAS, A. W. *J. Chem. Phys.*, 10, *pp.* 229–240, *April*, 1942.—The changes produced in the viscosities of ferric hydroxide hydrosols by ageing, heating and the addition of a number of electrolytes and a non-electrolyte, are studied, in some instances together with the attendant changes in the *p*H values and sp. conductances of the systems. Agreement with Poiseuille's law is demonstrated for typical cationic and anionic hydrosols. The decrease in viscosity of hydrosols on ageing and heating is accompanied by an increase in sp. conductance. The addition of salts and acids to these hydrosols results in a viscosity decrease followed by an increase at higher electrolyte conc. The viscosity decrease produced by ageing, heating and electrolyte addition is attributed to conc. changes, micellar charge and agglomeration. A mechanism based upon a Donnan equilibrium between the dispersed particle and the dispersion medium is proposed to account for the effects observed. H. H. HO.

See Abstr. 2113 541.182.6 : 537.226.2

2193 541.182.6 : 541.133 = 3

Relations between electric conductivity and degree of dispersion of lyophile colloids. IV. Conductivity of sodium oleate solutions in presence of isomeric cresols. ANGELESCU, E., AND WOINAROSKY, A. *Kolloid Z.*, 93, *pp.* 199–207, *Nov.*, 1940.—Owing to the double ethylene bond, the sodium oleate solution differs in its behaviour from the solutions previously investigated

[Abstr. 1104 (1941)]. An antibatic effect of the lyosorption is due to the presence of 2 fields, the free affinity field of the double bond and the electric field produced by the dissociated groups. Thus either the inhibiting or the favouring effect of lyosorption preponderates, and the conductivity/cresol-conc. curve shows, for higher Na-oleate conc., first a min. and then a max. The effect of a change in the degree of dispersity is negligible. The relative values of the min. and max. depend on conc., temperature and cresol isomery. R. N.

See Abstr. 2143 541.182.6 : 632.94 : 539.215.4

2194 541.182.6.045.2 : 541.133 = 3

On the determination of the electrolyte content in the intermicellar part of colloidal solutions. WINTGEN, R. *Kolloid Z.*, 93, *pp.* 257–280, *Dec.*, 1940.—Even with normally proceeding ultrafiltration with collodion diaphragm and porcelain sieve, conclusions drawn from the composition of the filtrate, with respect to the intermicellar liquid of the sol, are uncertain, since concentration anomalies occur and part of the H ions may be replaced by Ca ions from the sieve. Better results are obtained by using bags of collodion as previously described [Abstr. 827 (1933)]. The conductivity of the filtrates is calculated from the H- and Cl-ion activities under consideration of the Donnan equilibrium. The sp. conductivity may also be calculated from these activities and the ion migration velocity of the sol. R. N.

See Abstr. 2197 541.183.24 : 541.45

2195 541.183.26 = 3

Researches on adsorption and desorption processes in flow through granular adsorbent layers. WICKE, E. *Kolloid Z.*, 93, *pp.* 129–157, *Nov.*, 1940.—Pursuing previous work [Abstr. 1945 (1939), 2587 (1940)] the author develops a theory of isothermic sorption in layers of porous grains in a flow of gas. Although the results of the investigations cannot directly be applied to technical processes in which considerable heat effects occur, they form a basis for further research in this direction. With the 3 variables of time, length of path and concentration, a sorption surface is obtained; plane sections of this surface parallel to the 3 co-ordinate planes give, respectively, the conc./time function for const. length of path, isochrones, and isobars. A comparison is made, for each set, between the curves at 0° and 100°C. The theory developed explains the trend of these curves by taking into consideration the speed of sorption inside the grains, the longitudinal mixing in the interstices between the grains, and the curvature of the adsorption isotherm. Errata in previous papers are corrected. R. N.

2196 541.183.595 : 631.414.3 = 3

On the structure of the hydrate film on inorganic soil colloids. NITZSCH, W. VON. *Kolloid Z.*, 93, *pp.* 110–115, *Oct.*, 1940.—Starting from the fundamental difference in the densities of water adsorbed by clay etc., and by mineral salts, the author investigates the direct and indirect adsorption of water and of ions on an "inorganic sorption complex," i.e. a body containing a core of a crystalline clay-mineral particle. The adsorption of dipoles is mainly due to the intensive electric field of the crystal at its surfaces acting in a definite direction, and therefore takes place at the plane faces of the crystal. The adsorption of ions, especially cations, is principally due to van der Waals forces and occurs at the rough side faces, at edges, fissures and crystal gaps. R. N.

2197 541.45 : 541.183.24

A study of ionic adsorption in solutions of silica and alumina. NUTTING, P. G. *J. Wash. Acad. Sci.*, 32, *pp.* 117–122, *April* 15, 1942.—Experiments are described in which the addition of alkali to acid solutions renders them more acid and in which the addition of acid to alkaline solutions increases their alkalinity. Curves of electrometric titration of silica and alumina solutions with KOH show a regular progression with conc. The silica curves drop about 1·5 *p*H units, the alumina curves about 5 units, before the final rise to alkalinity. The silica solutions reach max. acidity on addition of alkali just less than the combining proportion, the alumina solutions on addition of a fixed amount of alkali which, in the most dilute solution, is 300 times the combining proportion.

See Abstr. 2136 541.634 : 539.17

See Abstr. 2189 541.64 : 541.182.5

See Abstr. 2200 541.64 : 679.51 : 541.8

2198 541.651 : 667.2

Colour and constitution. II. Absorptions of some related vinylene-homologous series. BROOKER, L. G. S., WHITE, F. L., KEYES, G. H., SMITH, C. P., AND OESPER, P. F. **III. Absorption of 2-*p*-dimethylaminostyrylquinoline and its salts. The effect on absorption of a benzene ring in the chromophoric chains of dyes.** BROOKER, L. G. S., AND SPRAGUE, R. H. **IV. The absorption of phenol blue.** BROOKER, L. G. S., AND SPRAGUE, R. H. *J. Amer. Chem. Soc.*, 63, *pp.* 3192–3231, *Nov.*, 1941.—Deals with absorptions of 5 related vinylene-homologous series. Three of the series are of the amidinium-salt type in which an increase in length of the conjugated chain produces a shift of absorption toward the longer waves. The compounds of the fourth series contain an acetyl group attached to one of the nitrogens and have much smaller values of $\lambda_{max.}$ than the corresponding unacetylated compounds. The fifth series consists of amidine bases which absorb at markedly shorter wavelengths and are correlated with inhibition of degeneracy. Part III investigates the absorption of 2-*p*-dimethylaminostyrylquinoline and its salts, and the effect on absorption of a benzene ring in the chromophoric chain of dyes. It is found that the effect of a benzene ring in reducing the degeneracy of conjugated systems is a principle of wide application and is illustrated by a number of examples. Part IV considers in detail the absorption of phenol blue, which is an un-ionized dye. H. H. HO.

See Abstr. 2146 541.68 : 677.31 : 539.216

2199 541.8

The solubility diagram for the system benzene-pyridine-water. SMITH, J. C. *J. Phys. Chem.*, 46, *pp.* 376–380, *March*, 1942.

2200 541.8 : 541.64 : 679.51 = 3

On solubility of nitrocellulose. WADANO, M. *Kolloid Z.*, 93, *pp.* 324–338, *Dec.*, 1940.—[See Abstr. 2139 (1942)]. The author determines statistically the connection between the N contents of the nitrocellulose and its solubility in various simple and mixed

solvents. For degrees of polymerization above 100–150 the solubility is not dependent on viscosity or degree of polymerization. Below this limit, solubility increases with decreasing viscosity. This is explained by the change in the ratio of NO_2 groups to OH groups. The influence of this ratio is discussed for the solvents investigated. R. N.

2201 541.8 : 678

Solvents and plasticizers for chlorinated rubber. RAYNOLDS, J. W., RADCLIFFE, M. R., AND VOGEL, M. R. *Industr. Engng Chem.*, 34, *pp.* 466–473, *April*, 1942.—A viscosity blending chart is devised for various solvents. Data are included on the solvent power of 26 of the more common solvents as determined by their dilution ratios. The tolerance ratio for diluents in the presence of butyl acetate was determined for 13 non-solvents or diluents. A study was made of the film hardness of chlorinated rubber and various representative plasticizers at different percentage loadings. Data are presented covering the percentage elongation of the various plasticized films using different loadings of 9 plasticizers.

2202 542.48 : 518.3

Nomographs for minimum reflux ratio and theoretical plates for separation of binary mixtures. SMOKER, E. H. *Industr. Engng Chem.*, 34, *pp.* 509–510, *April*, 1942.

2203 542.48 : 631.432

Determination of water in soils. LOCKET, G. H., AND BARRETT, W. H. *Nature, Lond.*, 149, *p.* 612, *May* 30, 1942.—The sample is distilled under xylene or toluene, the water which comes over being weighed or its volume read off.

2204 542.7

The use of fusible alloy in vapour diffusion pumps. ABBOTT, F. R. *Rev. Sci. Instrum.*, 13, *p.* 187, *April*, 1942.

See Abstr. 2068 544.8 : 535.34 : 535.247.4

GEOPHYSICS

2205 550.384 : 523.74

The corpuscular geomagnetic index and related solar changes. CLAYTON, H. H. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 15–20, *March*, 1942.—A statistical study is made of the daily *K*-values of corpuscular solar radiation for the years 1938–41. Maxima return at periods of from 26 to 28 days, clearly indicating the solar rotation period and perhaps also its variation with latitude. On the average, max. in the *K*-values follow max. in the Zürich sunspot numbers after about a day; but individual connections can be traced only in marked outbreaks of solar activity, which are followed after 1·3 days by peaks in the geomagnetic index. A. HU.

2206 550.385 : 523.74

Magnetic storms and solar activity 1941. *Observatory*, 64, *pp.* 240–241, *May*, 1942.

See Abstr. 2125 550.385 : 537.591.5

2207 551.521.63

Measurements of ultra-violet solar- and sky-radiation intensities in high latitudes. COBLENTZ, W. W., GRACELY, F. R., AND STAIR, R. *J. Res. Nat. Bur. Stand., Wash.*, 28, *pp.* 581–591, *May*, 1942.—Data are given on the intensity of the biologically effective ultra-violet radiation, of wavelengths 3 200 Å and shorter, from the sun and the entire sky, incident on a horizontal plane, under various meteorological conditions, in high latitudes. The data were secured by a photo-electric cell and automatic recording apparatus. For the same solar heights, in the highest lat. visited (78° N.) the intensities are higher than in lat. 62° N., but lower than at 39° N. (Washington), in agreement with expectation, taking into consideration the distribution of ozone in the stratosphere with latitude and the season. In the highest lat., at noon on the clearest days in mid-summer, the intensity ranged from 30 to 40 μW/cm.^{2}

2208 551.582.3

Climatological data. GRAY, R. W. *Climatol. Data, W. Indies*, 20, *pp.* 65–72, *Sept.*, 1940.

2209 551.582.3

Climatological data. GRAY, R. W. *Climatol. Data, W. Indies*, 20, *pp.* 73–80, *Oct.*, 1940.

2210 553.98

The oil and gas industry of Colorado. BARB, C. F. *Colo. Sch. Min. Quart.*, 37, [130 *pp.*], *April*, 1942.—A description of the individual oil and gas fields and the refineries, with diagrams, maps and tables.

VARIOUS SUBJECTS

See Abstr. 2089	577.15 : 535.6.08
See Abstr. 2066	595.7 : 535.247
See Abstr. 2036	612.1 : 531.787
See Abstr. 2187	628.16 : 541.18.045.2
See Abstr. 2074	631.41 : 535.33
See Abstr. 2196	631.414.3 : 541.183.595
See Abstr. 2203	631.432 : 542.48
See Abstr. 2143	632.94 : 541.182.6 : 539.215.4
See Abstr. 2186	66.06 : 541.18.043
See Abstr. 2140, 2141	66.067 : 541.18.045.2 : 539.215.2
See Abstr. 2147	661.713 : 539.216.1
See Abstr. 2198	667.2 : 541.651
See Abstr. 2146	677.31 : 541.68 : 539.216
See Abstr. 2201	678 : 541.8
See Abstr. 2139	679.51 : 539.214
See Abstr. 2200	679.51 : 541.64 : 541.8
See Abstr. 2093	77 : 535.8
See Abstr. 2142	77 : 539.215.2

2211 771.3 : 621.385.8

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See Abstr. 2094	771.35 : 535.81
See Abstr. 2064	771.54 : 535.24
See Abstr. 2180	771.54 : 541.141
See Abstr. 2181	771.54 : 541.141.11